NEW YORK SEATTLE

MOTORSHIP

Devoted to Commercial and Naval Motor Craft

"MOTORSHIP" is entered as second-class matter at the Post-office at New York, N. Y., U. S. A., July, 1918, under the Act of March 3rd, 1879.
Office of Publication, 44 Whitehall St., New York, N. Y.

Issued Monthly
PRICE 25 CENTS
Domestic, $3.00 per year
Foreign, $3.50 per year

AUGUST, 1919
Vol. 4 No. 8

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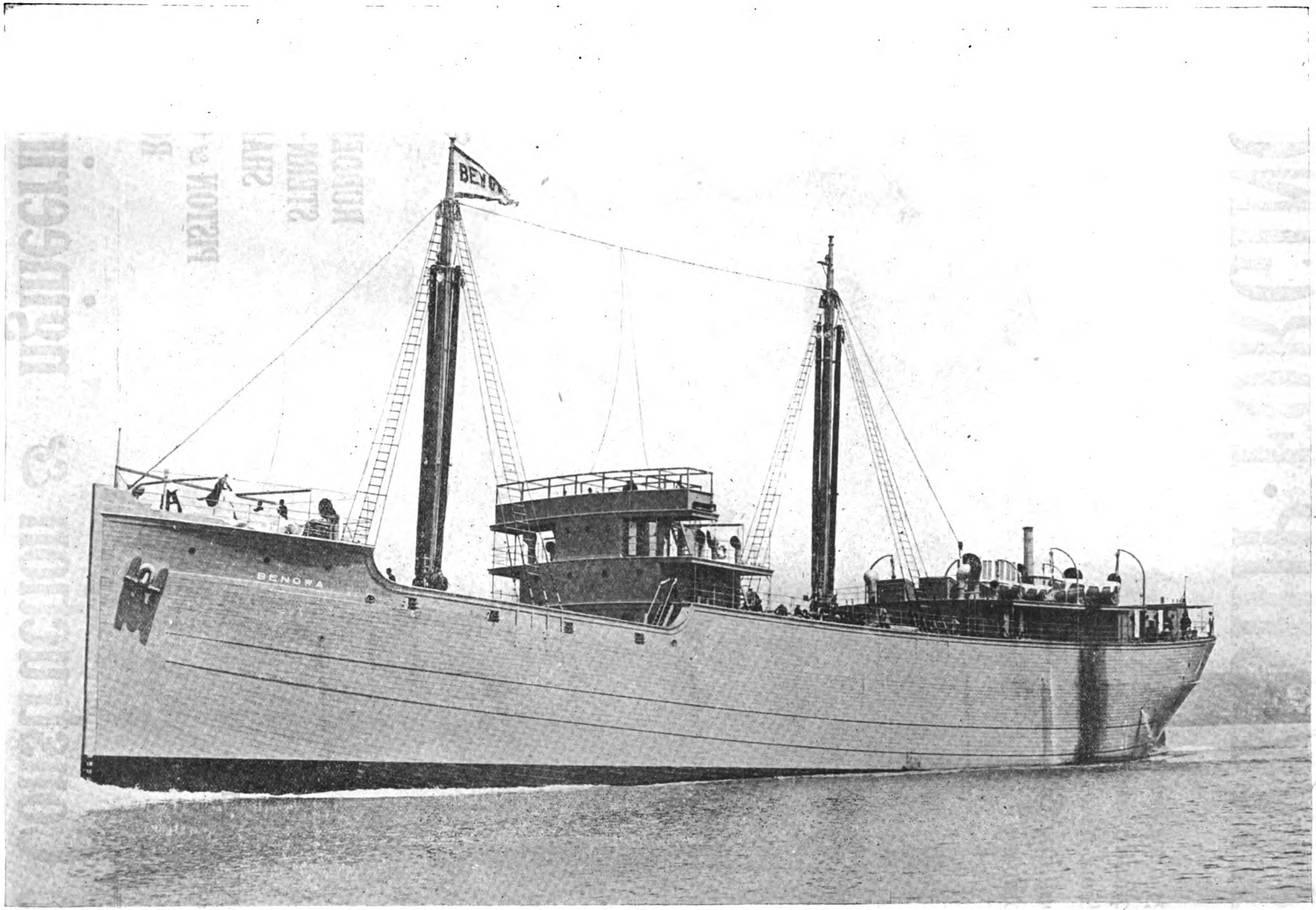

ECONOMICAL MOTORSHIPS—No. 32

The M. S. "Benowa" on her trial trip. This vessel marks the advent in Pacific Coast motorship construction of electrically driven auxiliaries. Power for cargo handling and the steering gear is also taken from the electric-generating sets. She is a full-powered motorship with twin 500 h.p. McIntosh & Seymour Diesel engines. Her dimensions and other particulars are as follows: Length 282 ft. 6 in. over all; 48 ft. 0 in. beam; 27 ft. 0 in. molded depth; draft 26 ft. 0 in. loaded; speed 10 knots; fuel consumption per b.h.p. per hr. 0.41 lbs. The supervising engineer for the Australian Government gives the comparative deadweight capacities of the steam and motorship as 3,437 tons and 3,909 tons respectively on the same bare hull weight of 2,004 tons. This vessel built by the Patterson-MacDonald Shipbuilding Co. of Seattle, Wash., is the first of five wooden full-powered motorships to be built and engined in America for the Australian Government

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MOTORSHIP

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WILSON BUILDING
NEW YORK, N. Y.

71 COLUMBIA STREET
SEATTLE, WASH.

PUBLISHED MONTHLY IN THE INTERESTS OF COMMERCIAL AND NAVAL MOTOR VESSELS
AND FOR RECORDING PROGRESS OF THE MARINE
INTERNAL-COMBUSTION-ENGINE

Published by MILLER FREEMAN & COMPANY
Advertising Manager—J. CHARLES RUIF

President—MILLER FREEMAN

Manager—RUSSELL PALMER

Editor—THOS. ORCHARD LISLE
A. M. S. Naval Engineers. A. M. I. Marine Engineers

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Assoc. Mem. Am. Soc. N. A. & M. E.

Supscription rates: U. S. A. and Mexico, $3.00 per year. Canada and foreign countries in the postal union, $3.50. Single copies. United States, 25c. Other countries, 50c.
"Motorship" is published on the 25th of the month, and all changes in and new copies for advertising must be in the hands of the publisher prior to the 5th of each month. Notice of discontinuance of advertising must be given before the 1st of the month, preceding issuance.

Great Britain. W. S. Smith & Son. Ltd., London. **Australia.** Gordon & Gotch, Sydney & Melbourne.

The oil-engined motorship has arrived! It is such a pronounced economy that it was bound to come. Nothing could stop it! And all obstacles have been removed as fast as they arose. The law of progress has seen to that. Very strong prejudices stood in the way of steam. But, one after another they were swept aside and steam reigned triumphant for a century. Steam now has had its day! Its zenith has passed, and gradually but surely it is being superseded by the economical internal-combustion power. Steamships are becoming decadent. America, the most important oil-producing country, is to be the greatest motorship-owning nation. Let us all co-operate and assist to make that day soon.

August, 1919 Vol. 4 No. 8

EDITORIAL

FUTURE OF THE OIL ENGINE IN OUR MERCHANT SHIPS

TO all who are looking ahead in contemplation of—or actively planning—the future of the American merchant marine, the establishment and maintenance of the fleet we have found to be an essential to both the economical and national prestige and even safety, is a very complex and sternly urgent problem. The two fundamental forces governing the maritime future of the nation will be our legislative and engineering foresight and skill. These heretofore have been exercised by generally opposing bodies of men, but who are now and will have to be even more so, closely associated in harmonious effort to build-up and preserve our nation's wealth and power overseas as well as her domestic wealth thereby.

Without entering into a discussion of the legislative phase of the subject there are several angles from which to view the engineering aspect, and undoubtedly the most attractive and promising of assured success is the probable extensive introduction of the Diesel and surface-ignition heavy-oil engines in merchant shipping. This has become a field of comparatively broad scope, and it is felt that the point of greatest stress with other things being equal is the economical operation possible of attainment with this type of machinery. In his work on cost data Gillette says that the definition of good engineering in the broad sense should provide that **economical** achievement of any given object or result be the fundamental basis of its worth as an engineering achievement. And so it should! This applies with especial emphasis to the production of ship propulsion when the operating costs of our vessels are now and will be much higher than any others competing under another flag. Such production of economical propulsion is the solid-rock that the American shipowner must have within reach before the year is out, and it is confidently expected he will demand that no stone be left unturned that may lead a way to give him a foothold and a chance to fight on somewhat equal terms with the ships of other nations in the field of world-commerce.

It is on this basis of economic worth that the marine heavy-oil-engine advocates pin their faith and both here and abroad (and unfortunately more abroad than here) and they have vindicated their faith with facts.

A comparison of the achievements in the adoption and construction here and abroad of full-powered Diesel engined vessels show clearly the difference in the mental attitude of our American shipowners, or perhaps naval-architects and engineers, as compared with the clear-visioned foresight and albeit pioneer spirit of the foreign merchants and their technical advisers. However, enormous profits have little value in the coming race for opportunity, for it is logical to assume that our foreign friends have dispersed those profits as dividends, and, unless their policy has been to write-off a generous percentage of earnings in surplus and a sinking-fund for use in the coming economic adjustment, they are as much bound to attain dividend earnings in the future as we hope to with our new and promising merchant marine.

The application of the internal-combustion engine to marine propulsion has now the support of many times the number of both shipowners and engineers it had a few years ago, and it is without doubt a happy solution to the problem of cutting operating-costs in nearly all trades and routes the world over. Its speedy adoption to the degree many are convinced is imperative, seems to rest more upon intensive education among those financially interested, along with a generous policy of "service" to the purchaser and contract terms equal to those he may obtain from the builders of steam-machinery. The actual perfection of a reliable engine is an accomplished fact.

It is always the experience of advocates of new machinery having economy and reliability as the outstanding features, that the claim finally proven establishes a co-operation between builder and user and a universal demand that is as complete as the application of the improvement will permit. Of course economy in the last analysis is effected by first cost, maintenance or repairs, operation or attendance, fuel, life and depreciation, and reliability. Every American shipowner insists on making his first installation of paper, uses ink for fuel, and runs it at a substantial profit in figures before he will go out after those in dollars-and-cents of which he has already lost a part, besides the value of the operating experience for the period lost.

The files of "Motorship" reveal repeated instances of immediate operation in a satisfactory and reliable manner of Diesel engine installations the duplicates in design for which were available; in lieu of a complete adherence to a new type of steam-machinery that presented as many unfamiliar problems to the average marine-engineer as those to be found in a Diesel-engine installation. It is really a question of reliability of personnel as much as of machinery which the shipowner will find to be a large factor in producing satisfactory log-books at the end of a year.

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The Diesel Engine in Great Lakes Freighters

Economical Cargo Handling Supplemented by Economical Propulsion

By R. D. KARR

GOVERNMENT statistics have shown for years that the small tonnage of waterborne freight carried in American bottoms was almost entirely composed of Coastwise and Great Lakes commerce. The latter has been the largest portion of the trade in spite of the fact that navigation is open only about eight months of each year.

The peculiarities of this regional commerce are the result of numerous circumstances. They have for that reason presented an opportunity for the development of characteristically American methods in obtaining speed, economy and volume in handling bulk freight. The enormous tonnage is composed mostly of grain, coal and iron ore. It has been a highly specialized problem and called for highly specialized apparatus for handling it.

A few of the outstanding features of the problem may be mentioned. As stated above, the cargoes handled are bulk grain, iron and coal. The season's activity is cut short to eight months of each year. Fuel is perhaps the cheapest in the world (coal is now about $5.50 a ton but used to be about $3.25). No "salt water" troubles are experienced with the machinery and no boiler feed need be carried as the lake waters provide excellent feed. Trade routes and cargoes remain unchanged year in and year out. Ship operation approaches the definite and tangible problem of train despatching more than any other vessel operating proposition of its size in the world.

An indication of the strides made at the ore handling terminals in providing the special equipment best suited for the problem is shown in the accompanying photographs. They illustrate Wellman-Seaver-Morgan ore unloaders of which fifty are in use on the Great Lakes. These monster machines have been in service for several years and show a sustained operating cost ranging from 2½c to 4½c per ton of cargo handled, which cost includes superintendence, labor, repairs and material on the machines as well as the cost of power and light.

The main parts of this machine may easily be seen from the various illustrations and their operation described as follows:

The main frame work spans the rail tracks and is mounted on trucks for movement parallel to the tracks. This main frame extends beyond the rear runway over a temporary storage pile where the ore can be discharged if desired. Upon the main girders of the frame work are provided rails along which travels a trolley. This trolley or main carriage supports a balanced walking-beam from the outer end of which is hung a stiff bucket leg. At the lower end of this leg is the bucket which is operated by machinery located on the walking beam. All horizontal movements of the bucket are accomplished by moving the main carriage or trolley back and forth on the girders.

The vertical movements of the bucket are accomplished by the operation of the walking beam. The bucket end, being out of balance, descends by gravity as soon as the brakes of the hoisting mechanism are released.

The mechanism controlling this hoisting operation is located in the enclosed house on the walking-beam. Ropes from the winding drums of this mechanism pass around sheaves located in the rear end of the carriage and thus the hoisting of the bucket is accomplished by pulling down the rear end of the walking beam.

The receiving hopper is located between the main girders at the forward end and has a capacity of three times that of the bucket. Its purpose it to serve as a momentary balancing point between the regularly deposited loads from the bucket and the filling of the cars. The bottom of the hopper is provided with outlet gates and the contents are thus discharged as required into a larry which runs on an auxiliary track, suspended from the underside of the main girders.

The larry, after receiving its load from the main hopper, moves to a point so that its contents can be discharged either into cars under the main girders or into a temporary storage pile under the cantilever at the rear end of the machines. The ore placed in this temporary pile cannot be reclaimed by this unloader. The capacity of the larry is between 35 and 45 tons; two loads of the larry constitute a full carload of ore.

This design of unloader has been built in two sizes, giving either ten or seventeen tons in the bucket shells. Control of the entire operations is accomplished by two men. One stationed in the bucket leg, directs the movements of the bucket and the travel of the main trolley; the other man is stationed on the larry and directs the operations of discharging from the hopper and filling the cars. Rotary motion is also provided for the bucket leg by means of ropes wound on the segment mounted near the upper end of the stiff leg. The machine is electrically operated and can complete a full cycle of operations in about 50 seconds.

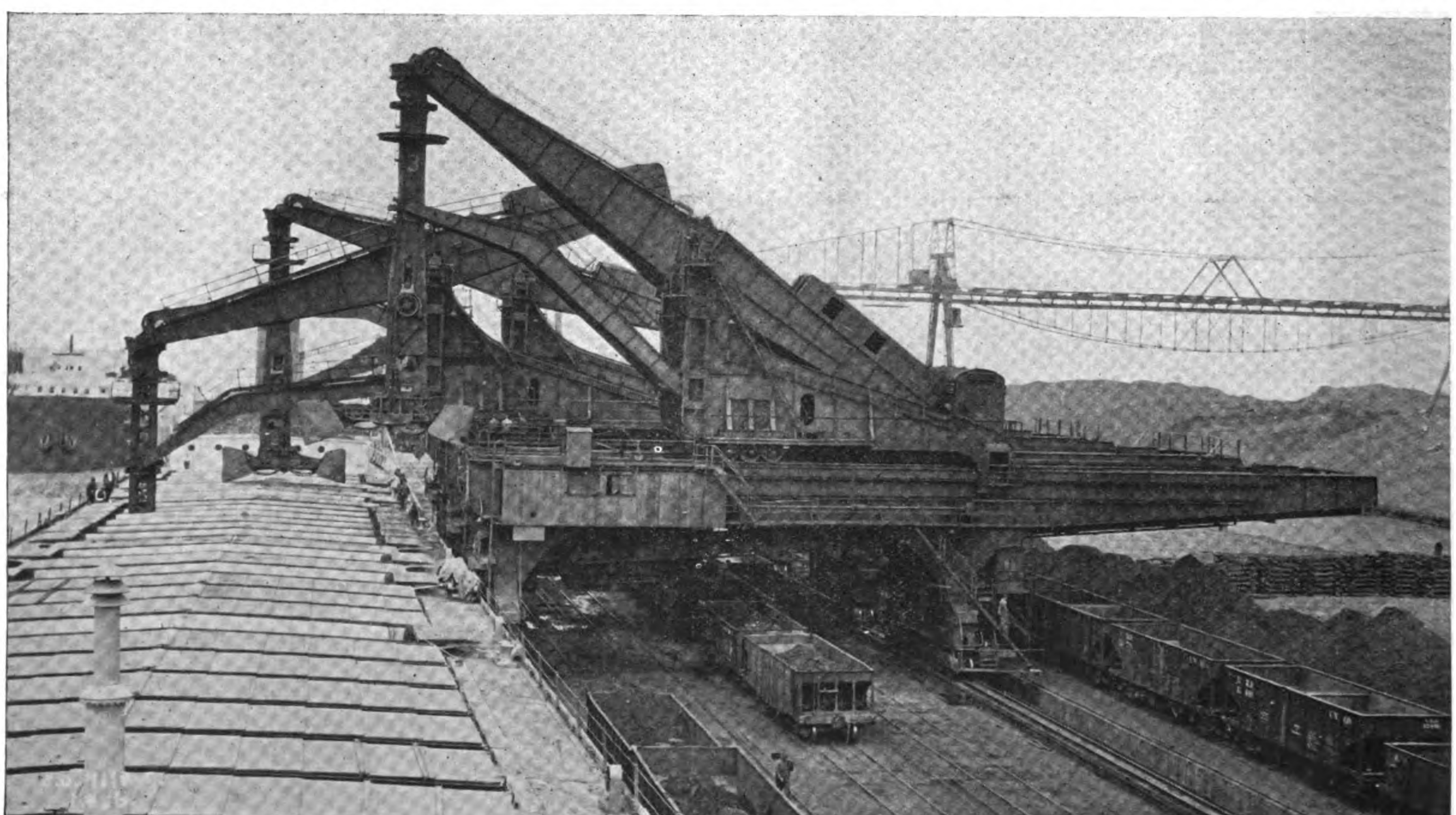
The unloading capacities of these machines are indicated by the following records: Eight machines, capacity 15 tons each, have unloaded seven boats (70,000 tons total) in 22 hours' time. Four machines all working in a 13,000 ton ship have completed unloading in three hours and twenty-five minutes. Such apparatus is typical of the high class terminal machinery to be found in the Great Lakes trade. The immense grain and coal elevators for loading and the extensive provisions for immediate and rapid unloading all contribute to the economical results obtained. The characteristic design of the ships illustrated in the photograps have been developed to meet the demands of that service.

Now we come to the propulsion of the ships. Let us consider the possibilities of decreasing the principal remaining cost factor in operating vessels on the Great Lakes. Ore can be unloaded for 2½ to 4½ cents a ton. For what can it be transported from one terminal to the other? Has the Diesel motor any economical advantages for this trade?

In the February issue on page 12, there was clearly demonstrated the ability of the Diesel engine, when installed in a ship, to increase both the net measurement tonnage space and the actual dead weight or cargo carrying capacity, over a steamship of the same power and dimensions. To re-iterate, we quote the following from a standard work on the marine Diesel engine. "A vessel of 2500-3500 tons displacement propelled by a steam engine of about 1100 or 1200 i.h.p. would consume under working conditions some 15 tons of coal per day, while a Diesel engine of equal or rather greater power (say 1000 b.h.p.) would require under 4 tons of oil or a reduction of at least eleven tons a day. . . . Considering only the slow speed Diesel engine of the ordinary type as adapted for marine work (e. g. for cargo vessels), it has been found that the approximate saving in weight for a 1500 shaft h.p. installation is somewhere in the neighborhood of 150 tons in favor of the Diesel engines, as compared with the steam equipment and approximately the same ratio applies for larger powers. . . . Allowing for all the economies effected, namely: in weight of fuel carried, weight of machinery and in the engine room space, it may be taken as a safe estimate, that with almost any class of vessel, an extra cargo can be carried equivalent to about 15 percent of the displacement of the vessel."

There is published elsewhere in this issue, a chart dealing with the sizes and capacities of the steamships and motorships which is directly applicable to the discussion in hand.

We have before us a list of steamships in the various fleets operating in the freight carrying



W.-S.-M. ore unloaders at docks of the U. S. Steel Corpn., Conneaut, Mich.

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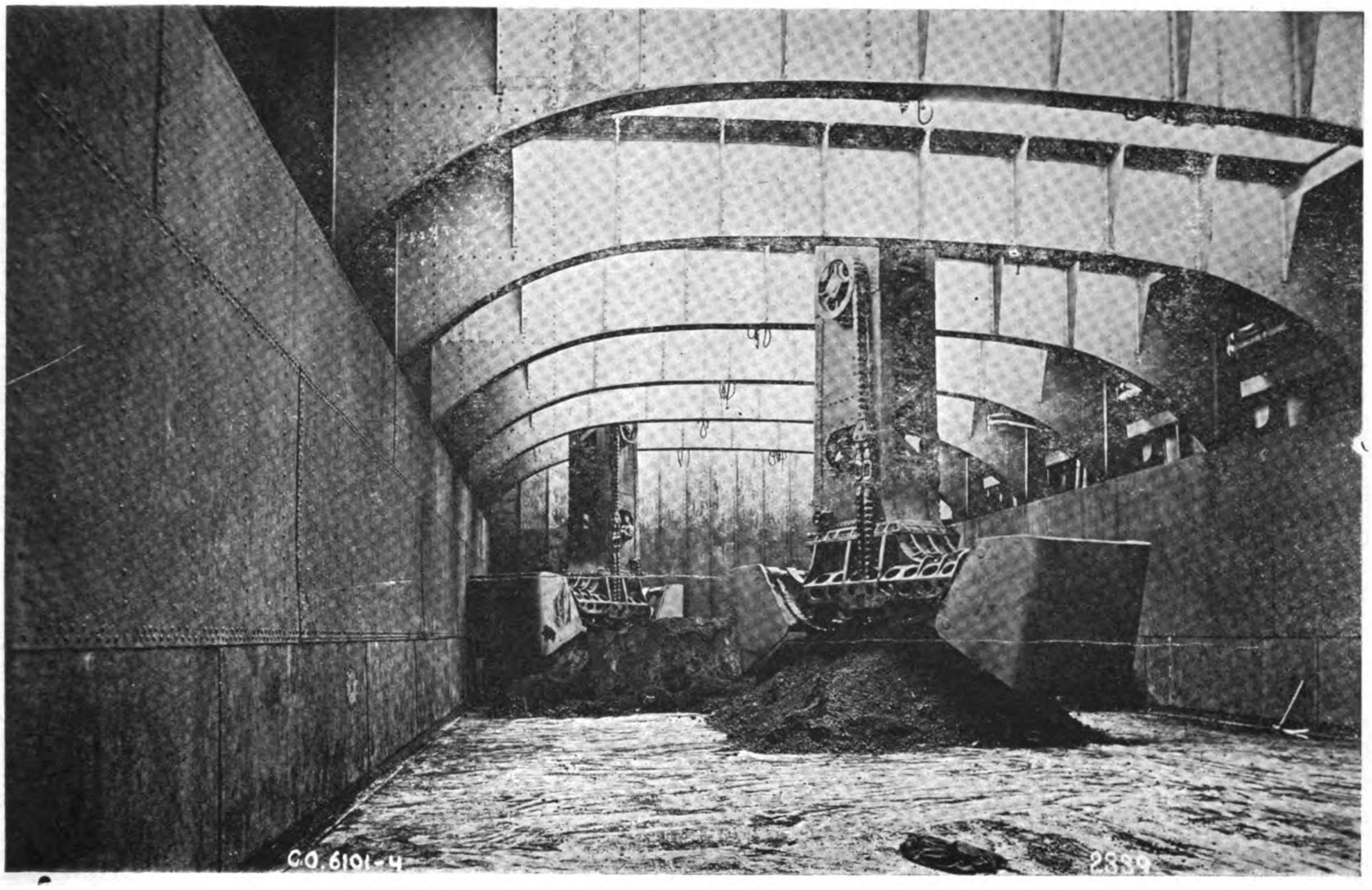

Showing ore unloaders at work in the hold of a lake steamer. Economy to the nth power! The motorship must not be neglected for this service

trades on the Great Lakes. A digest of these lists reveals the following figures:

No. of ships in the fleets	Total gross tonnage	Service
5	22,768	Bulk Freight
4	27,661	Bulk Freight
12	67,208	Freight
3	20,831	Bulk Freight
2	6,980	Bulk Freight
4	9,888	Freight
20	109,911	Freight
52	255,000	Freight
8	43,914	Freight
6	42,704	Bulk Freight
4	23,519	Bulk Freight
4	21,883	Coarse Freight
5	17,030	Freight
18	96,491	Freight
84	421,262	Freight
14	67,866	Freight
15	84,090	Bulk Freight
9	42,898	Freight
9	48,305	Freight
13	57,753	Oil Tanker
4	31,201	Freight
12	64,460	Freight
12	97,200	Bulk Freight
4	27,661	Freight
19	86,457	Freight
342	1,776,841 gr. tons	Bulk and Gen'l Freight

Further analysis shows that all these ships are of such size as to be potentially if not actually in the market for oil engines. Successful American designs have been built that are immediately applicable to these sizes, which we find range as follows:

No. of ships		Gross Tons
6	of	9,000—10,000
8	of	8,000— 9,000
42	of	7,000— 8,000
67	of	6,000— 7,000
52	of	5,000— 6,000
94	of	4,000— 5,000
50	of	3,000— 4,000
23	of	under 3,000

Additional ships are in service carrying both freight and passengers on scheduled runs. It is seen that these vessels would require powers ranging from 900 to 3,000 B. H. P. which are precisely the size of units now under construction by American engine builders. Many of these engines have been developed from successful European designs.

It is estimated that this tonnage will require for its propulsion by Diesel engines, a total indicated horse power of nearly 550,000 in about 400 units of 900 to 2,000 horse power each. The larger ships could be propelled with twin screws.

Proceeding with the economics of the problem, we quote figures obtained from the U. S. Bureau of Foreign and Domestic Commerce, showing the volume of the bulk cargoes handled on the Great Lakes.

Season of 1918

Coal shipped

Fuel	1,234,925 tons
Cargo	28,153,317 tons
Total	29,388,242 tons

Grain shipped

From Lake Michigan	87,409,900 bushels
From Duluth and Superior	75,322,194 bushels
From Ft. William & Pt. Arthur	79,509,787 bushels
Total	242,241,881 bushels
	6,488,680 tons

Season of 1916

Shipments of iron ore by water from

Lake Superior Dist. ....64,734,198 tons

Assuming this total increased to 70,000,000 tons in 1918 we have for the total bulk cargo transported by water to be:

Coal	28,153,317
Grain	6,488,680
Ore	70,000,000
	104,641,997 tons

The prevailing price of bituminous coal at any port on Lake Michigan or Lake Superior when delivered in carload lots was (1918) $5.55 to $6.05 per ton f. o. b. cars at dock.

Therefore, 1,234,925 tons at an average of $5.75 per ton gives a fuel bill of $7,100,818.75 per season.

The price of fuel oil as quoted in the Oil Trade Journal for July, 1919, was Illinois Pipe Line Co. July 9th, 1918, $2.38 per bbl.

There seems to be no facilities for bunkering fuel oil at Great Lakes ports but we are advised that the price for delivery in tank cars would be about 6 cents per gal. ($16.80 per ton 2240 lbs). The ratio of prices for coal and fuel oil per ton would therefore be $5.75 to $16.80 or 1 to 2.92 in favor of coal.

The relative consumptions of oil fuel in motorships and coal in steamers has been established at 0.38 lbs. of oil per b. h. p. for the Diesel engine and 1.65 lbs. of coal for the steam engine. Therefore, the ratio of consumptions is 1 to 4.46 in favor of the Diesel engine. The resultant *cost per horse power* will therefore favor the motorship by the ratio of 1.53 to 1.0. A saving of 34 percent in the fuel bill of $7,100,878.75 will amount to about $2,414,298.77 per season!

From the figures giving the fuel used and the cargo carried during the season of 1918, we can approximate somewhat the dead weight capacity of the entire Great Lakes cargo fleet per year. The sum of these two figures will not include stores, fresh water, lubricating oil, etc. However, fresh water is not carried for boiler feed on any lake boats and the other items are small and nearly the same for both types.

Therefore, the d. w. capacity of the entire fleet per season is:

Coal—fuel	1,234,925
Bulk cargoes	104,641,997
Total	105,876,922 tons

An indication of the economies effected simultaneously with an increase in carrying capacity may be had from the following figures. At the rate of one hundred tons per 1,000 H. P. saved in engine weights, (as quoted in the above reference) motorships could provide 55,000 tons more carrying capacity every time the present fleet of steamers arrives at the terminals. Also the net consumption of fuel oil would only be 1,234,922 tons (coal) divided by the ratio of consumption (4.46) or 277,000 tons. This provides an additional cargo carrying capacity of 827,000 tons, assuming all the boats in service average ten trips per season.

In conclusion, it may be mentioned that the low price of coal heretofore prevailing in the Great Lakes trade will never be reached again and the motorship using fuel oil has now an economical advantage that is substantial and permanent. This will be increased when the pipe line companies extend their service to make deliveries right at the docks in the lower lake ports.

SHIPPING BOARD NEEDS 1,500 FIREMEN

The United States Shipping Board announces that it has vacancies for 1,500 firemen in the Merchant Marine. The age limit is from 18 to 35 years; minimum weight 140 pounds. The pay of the marine firemen is $75.00 a month, with board and quarters free.

Fifteen hundred men at $75.00 will mean an expense of $112,500.00 per month. Then there are water tenders' and coal passers' wages in addition. Aside from the ever increasing expense the scarcity of men suitable for these duties is of itself evidence that the solution of the problem is to eliminate the need for them. With the motorship the fewer but higher paid positions, with better living conditions, will be quickly filled from the higher class of applicants attracted to the life in our merchant marine.

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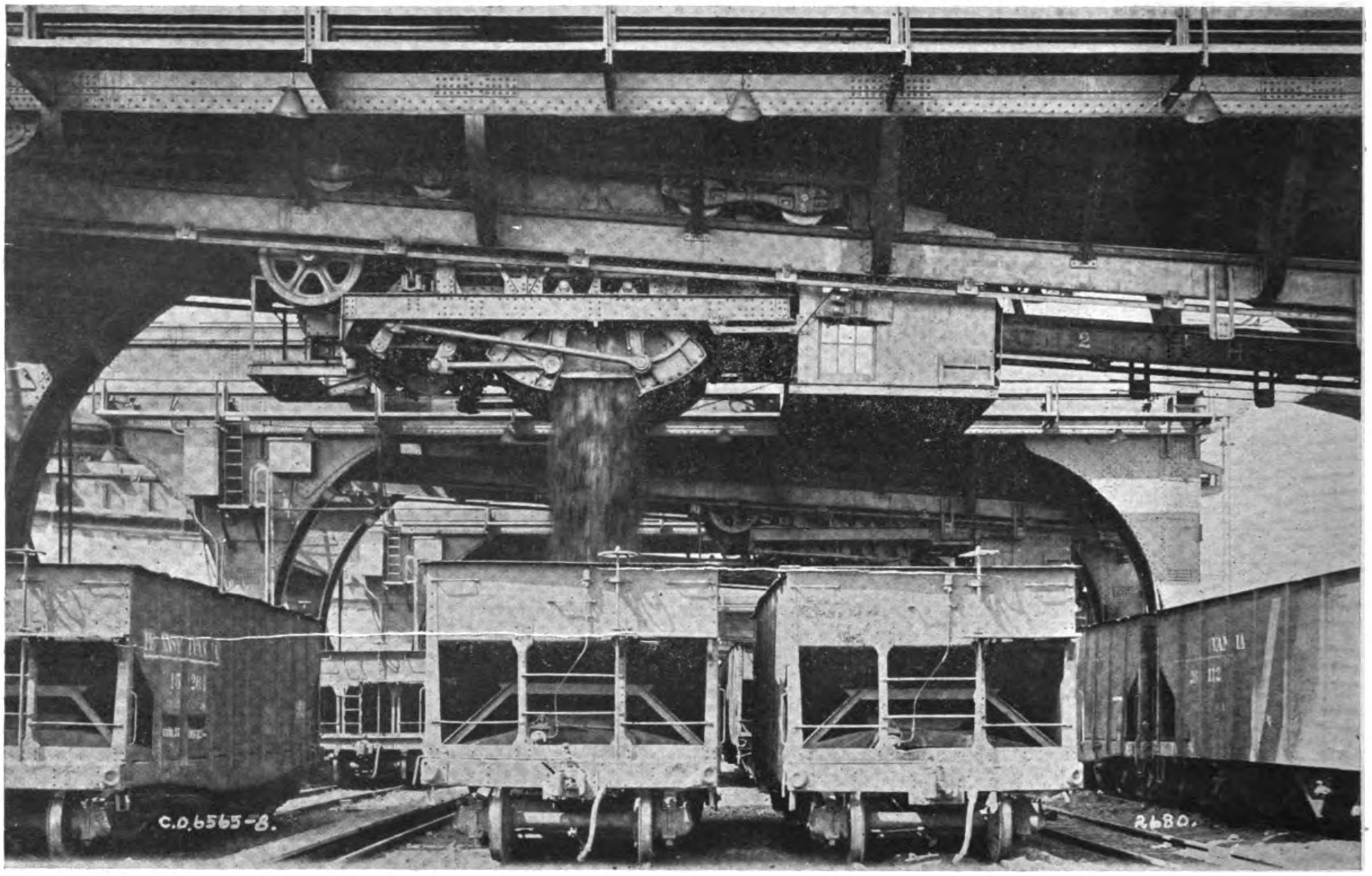

Welman-Seaver-Morgan ore unloaders used at the Great Lakes terminals. From the ship's hold to the freight cars in 50 seconds. Note the inclination of the larry tracks, the larry returning to the hopper by gravity

CARGO-HANDLING APPARATUS OF THE M. S. "LIBBY MAINE"

In view of the interest taken in the wooden motorship "Libby Maine," we publish an interesting deck-view of this vessel, looking forward from the bridge and showing part of the modern equipment which has made this oil-engined freighter internationally known. In the foreground are shown the electric, one man control winches. Absence of foot brakes and lowering friction in this device simplifies the work of the operator, who operates it by means of two handles—one in each hand, as in steam practice—and can hoist, lower or hold a load by very simple movements. In this respect this American winch has the advantage of many of the foreign makes installed aboard motorships and, which require a driver at each winch. A partial view of the "Libby Maine's" electric anchor winch is included in this picture.

Incidently, we will mention that the winches and windlass were designed and manufactured by the Pacific Machine Shop and Manufacturing Company of Seattle.

Electric deck machinery on M. S. "Libby Maine"

FUEL AT THE CANAL ZONE

In the June 18th issue of The Panama Canal Record, the price for coal to steamers passing through the Canal was quoted at $11.50 per ton (2,240 lbs.) delivered and trimmed in bunkers at either Christobal or Balboa. To ships not in transit the price was $11.50 at Christobal and $13.50 at Balboa. For quantities less than carload lots from the wharf, or 25 tons from lighters, the price was $13.00 at Christobal and $15.00 at Balboa. The price for bunker fuel oil was $2.50 per barrel of 42 gals. Mexican fuel oil was $2.00 per barrel.

In comparison with the above prices which apply to coal and oil fired steamships, the quoted price on Diesel fuel oil in Bulletin No. 18, effective June 1, 1919, is:

At Balboa, $4.00 per bbl. At Christobal $4.50 per barrel.

For lubricating oil the quotations were:

Oil, air compressor, cylinder, $0.52 per gal.
Oil, gas engine, "Texas" heavy in drum, $0.45 per gal.
Oil, gas engine, "Monogram" heavy in drum, $0.59 per gal.
Oil, marine engine, "Gargoyle" heavy in drum, $0.93 per gal.
Oil marine engine, "Atlas" heavy in drum, $0.59 per gal.

The above prices for fuels in the three types of combustion now in use may be analyzed by reducing all to same basis—the cost in dollars and cents per shaft horse.

	Steam Coal Burner Ton	Steam Oil Fired Bbl.	Diesel Bbl.
Quoted price	$11.50	$2.00	$4.00
Price per lb. in cents	5.514	0.635	1.25
Consumption in lbs. per b.h.p. hr	1.75	1.20	0.40
Cost per b.h.p. hr. in cents	0.9	0.76	0.50
Ratio of costs	1.77	1.50	1.00

An increase of from 50 to 77 percent of the fuel bill of a motorship having a 2000 h.p. installation on a voyage lasting 30 days would amount to $1,410 and $2,217.60. These sums would apply to the oil fired and coal burning steamships respectively.

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First American Full-Powered Motorship Equipped With Electric Auxiliaries

Machinery Details of the Motorship "Benowa"

By H. W. C. SMITH

UNUSUAL significance attaches to the launching on July 2nd of the full powered motorship "Benowa," built and equipped for the Commonwealth Government of Australia by the Patterson-MacDonald Shipbuilding Company of Seattle.

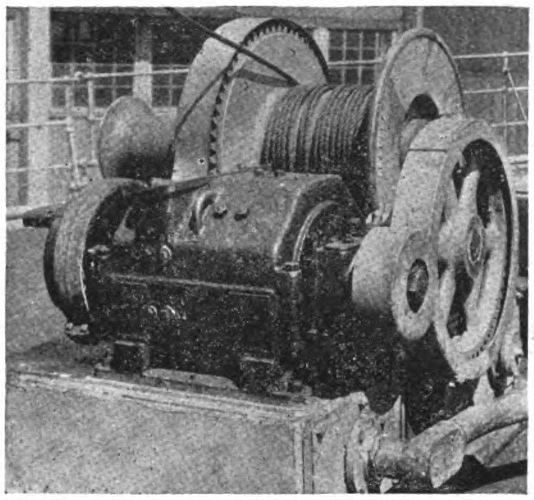
Age bows to precedent. Youth alone maintains that breadth of perspective which makes progress possible. It is this capacity for initiative which enabled the young and virile giant of the Antipodes, the Commonwealth Government, to decide upon the conversion to motorships of five vessels originally designed as steamers. The "Benowa" is the first of five of these motorships to be built for the same purchaser. Not an ounce of steam is used for any motive power or auxiliary operations, and for this reason if for no other a new era in shipbuilding and marine propulsion on the Pacific Coast may be said to have begun when the engines responded to the starting bell on her trial trip. The six hour run which followed completely vindicated the judgment of those responsible for the choice of her power equipment. Her main engines and auxiliaries gave an entirely satisfactory performance.

The "Benowa" is a full-powered motorship of the twin screw type, with three-blade propellers, 8 ft. diameter, 6 ft. 4 in. pitch, of solid cast iron. She measures 282 ft. 6 in. over all, 48 ft. beam, 27 ft. molded depth. Her construction is particularly rugged, Washington fir being used throughout, with all beams reinforced by knees.

Two main cargo holds having a cubic capacity of 80,389 feet and 65,800 feet, and a hold under the bridge deck with a capacity of 54,140 cu. ft. comprise her carrying space. The main holds have two hatches each, and are equipped with five-ton cargo booms and handling gear for loading and discharging.

The accommodations for officers and crew are ample and well oppointed. The seamen's quarters are in the forecastle, where also is their mess room. On the bridge deck, forward, the deck officers are quartered. The engine room force have their staterooms aft on this deck, where are also situated the galley and saloon. The pilot house and chart-room are above the deck officers' quarters. The engine room is aft.

The "Benowa" seems worthy of comment as embodying the new system of electric driven auxiliary machinery and in this respect differing from any vessel yet completed on the Pacific Coast. The main propelling machinery consisting of two 500 B.H.P. 6-cylinder full Diesel-engines together with the two Fairbanks-Morse hot-bulb oil-engines connected to generators for auxiliary power, constitute the full equipment of prime moving units aboard this vessel. All compressors (save those connected to the main engines), all pumps and all deck machinery, including the steering engine and windlass, are electrically driven.



Near view of electric cargo winch showing waterproof casing over motor and gear drive. The electric conduit may be seen entering the base

It seems evident that a great saving in space and operating cost has been effected in this arrangement. A motorship which is equipped with steam auxiliary machinery loses thereby a large proportion of the economy gained by the use of oil-engines as main propelling units. A donkey-boiler requires either coal fuel or an increased supply of fuel-oil. It also occupies considerable space, which means a loss of cargo carrying capacity. The fuel burned under a boiler is much less efficiently used than that burned in an oil engine. Moreover, with steam deck machinery, the losses through radiation and condensation coincident with the use of long steam lines are large, and damage to such lines in cold weather is likely. With the electrical equipment employed for auxiliaries these problems are more satisfactorily solved.

The main engines are two six-cylinder, four-cycle units of 500 B.H.P. each, built by McIntosh & Seymour Corporation of Auburn, N. Y. The cylinder bore is 16", the stroke 24¾". The crank shafts are 8" in diameter, in two solid forged sections for each unit, with flanged couplings. Each section has three throws set at 120 degrees. The main air compressor is driven off the ford end of the crankshaft. The design of all parts conforms to established practice and to the highest classification of Lloyds. Standard marine horseshoe thrust blocks set just aft of the engines.

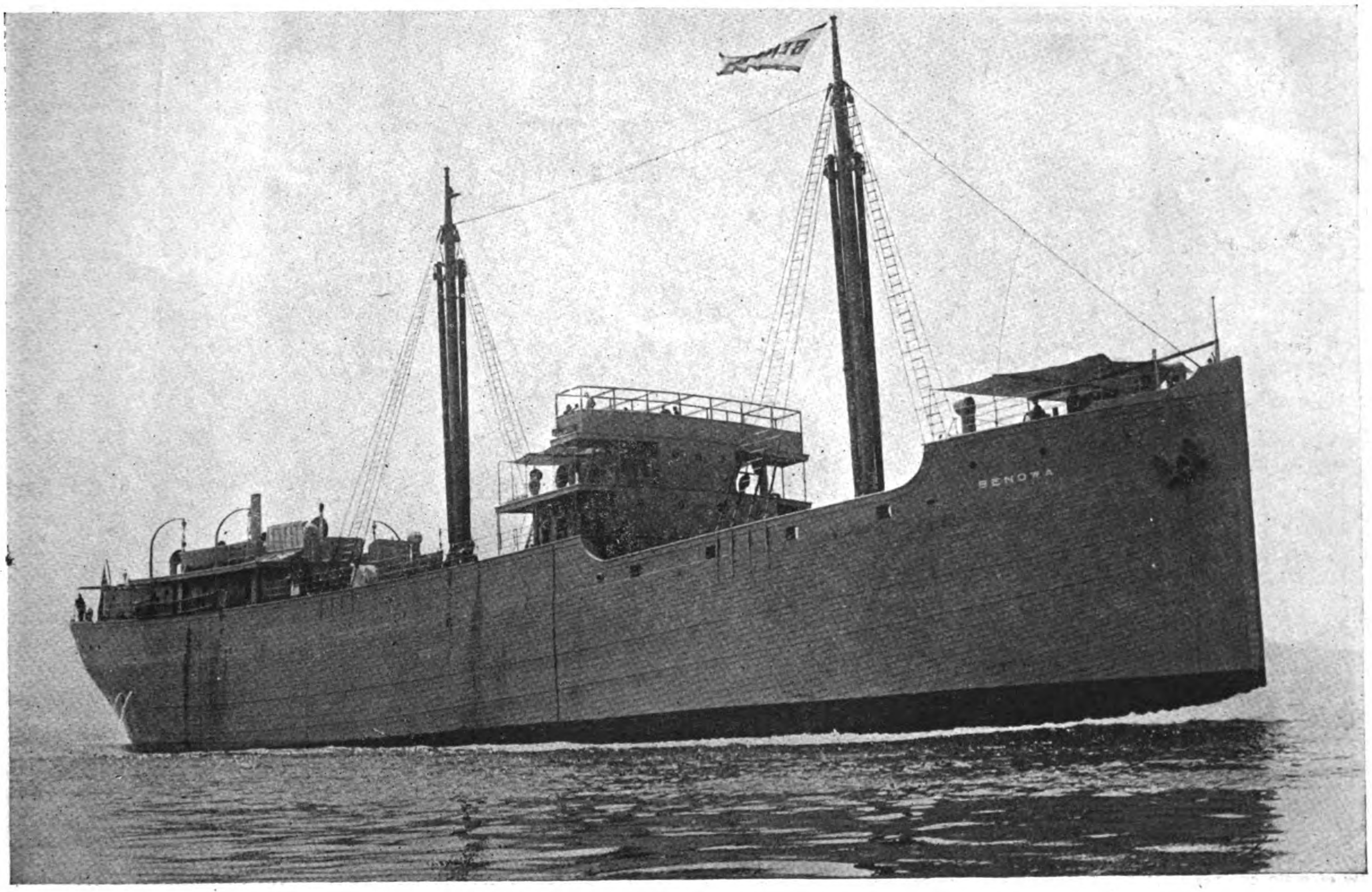
The pumps are situated on the port side of the engine room. These are all motor driven and include:

2 General Service Gould Triplex plunger pumps 5"x8" driven by 15 h.p. motor.

1 Oil Transfer Gould Triplex plunger pump 4"x6" driven by 2 h.p. motor.

1 Fresh water Gould Centrifugal Pump driven by ¾ h.p. motor.

1 Sanitary Gould Centrifugal pump driven by ¾ h.p. motor.



M.S. "Benowa" on her trial trip

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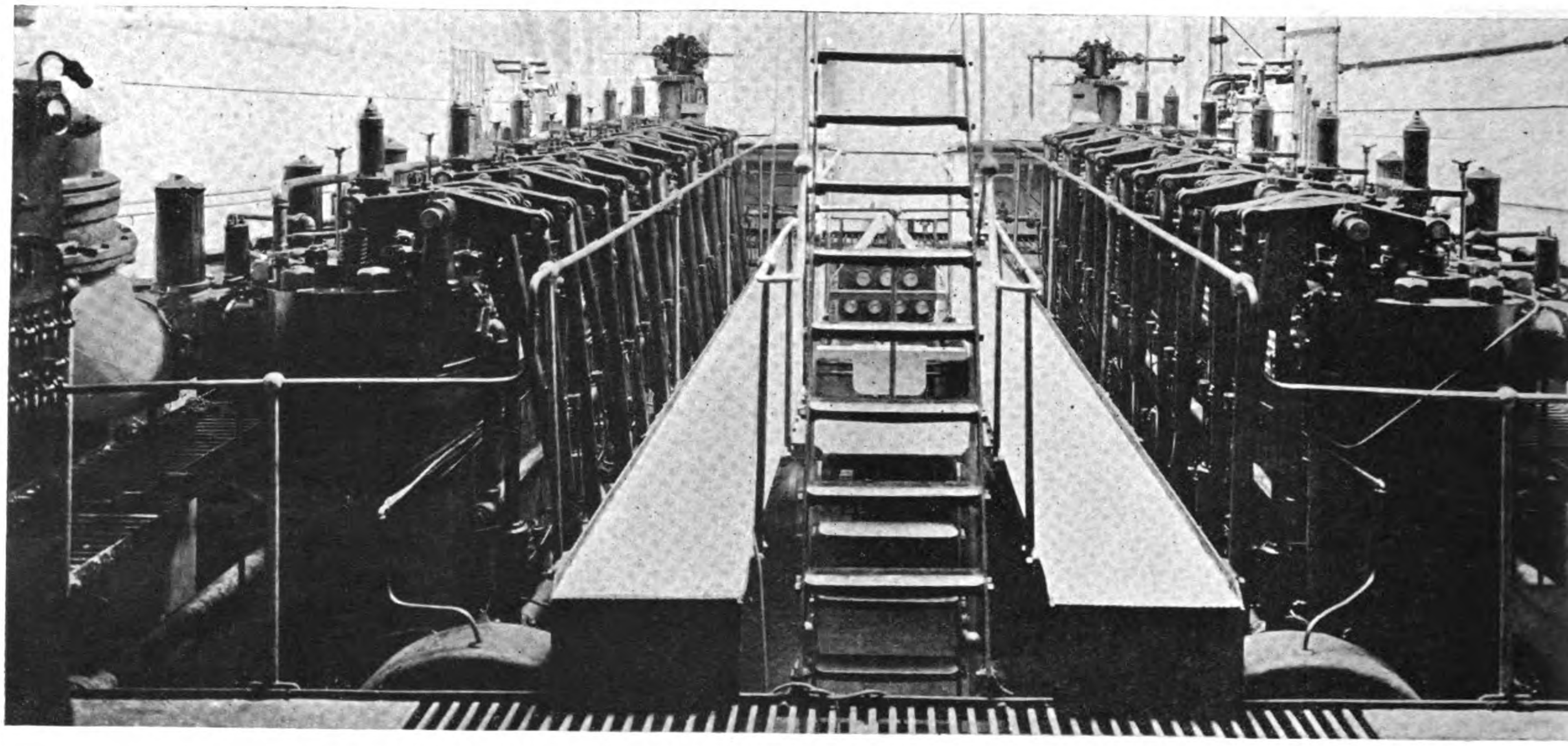

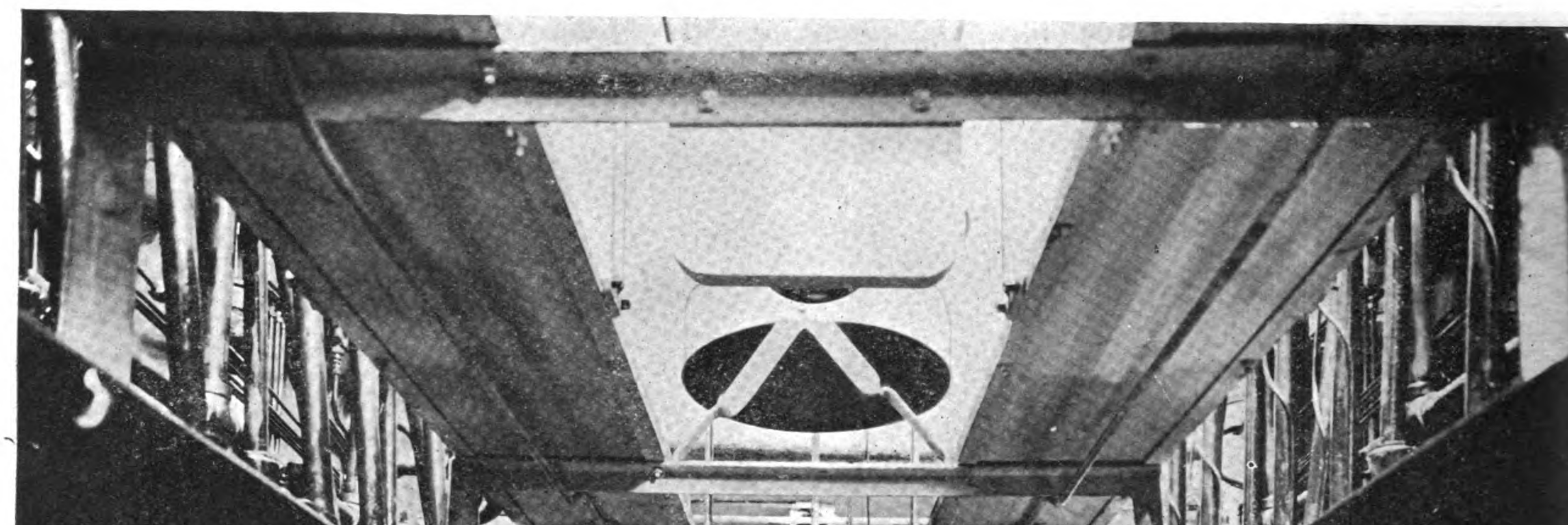

View of main engines of M. S. "Benowa," showing the operating station. Note the fuel pumps on each engine just above the oil guard under the camshafts and within reach of the engineer when working to bells. Above is the view of the upper platform looking forward from the dynamo flat showing the valve gear of the twin 500 b.h.p. six-cylinder McIntosh & Seymour engines. The fuel oil strainers supplied by the Elliot Co. may be seen mounted on the forward bulkhead

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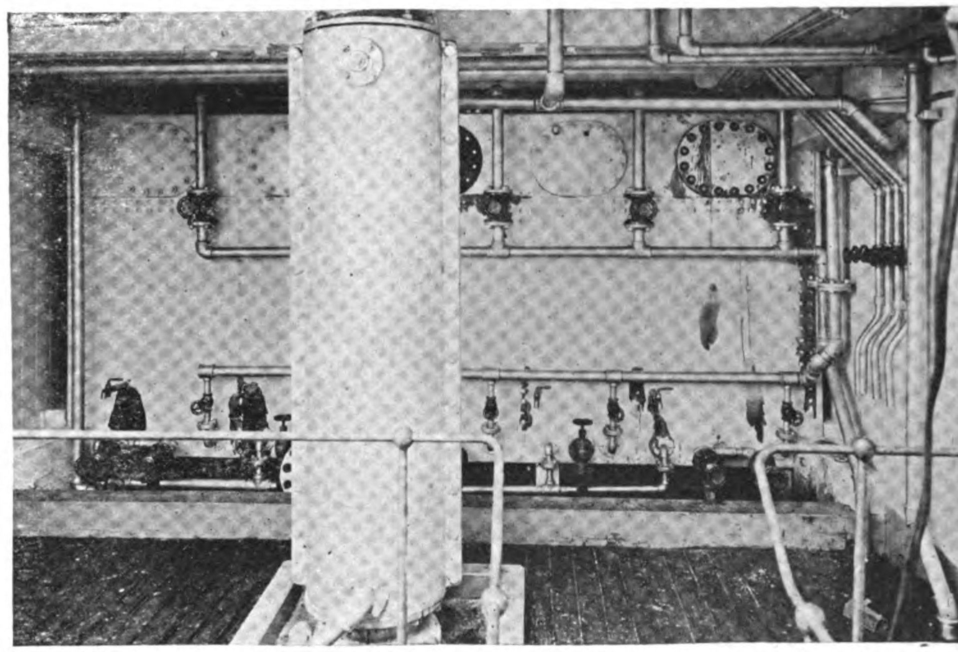
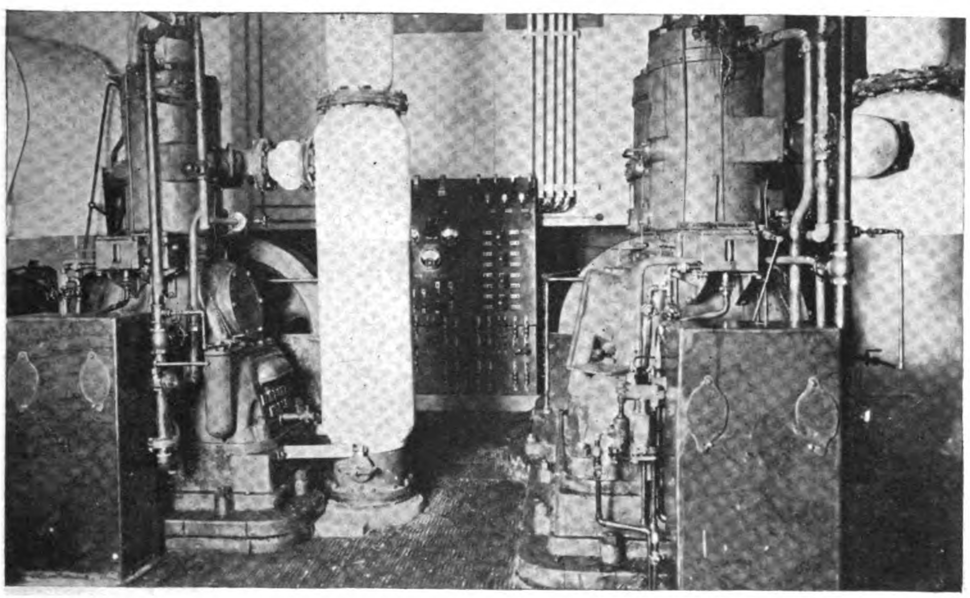
The compressors are located on the starboard side. The auxiliary unit is a two-stage compressor designed and built by the Rix Compressed Air & Drill Company of San Francisco, driven by a 25 h.p. motor, the booster being a singlestage compressor of the same make driven by a 3 h.p. motor.

On the dynamo flat, at the after end of the engine room and on the level of the upper gratings, are situated the generator sets. The larger unit consists of a 75 h.p. two-cylinder hot-bulb Fairbanks-Morse oil-engine driving a 60 k.w. 125 volt generator made by the General Electric Company. This set is sufficient to supply power to all deck-machinery and engine-room auxiliaries, and will be used in port when loading or discharging cargo. As an alternate, for use during a voyage, a smaller set is provided. This consists of a single cylinder 37½ h.p. engine of the same make driving a 30 k.w. 125 volt generator.

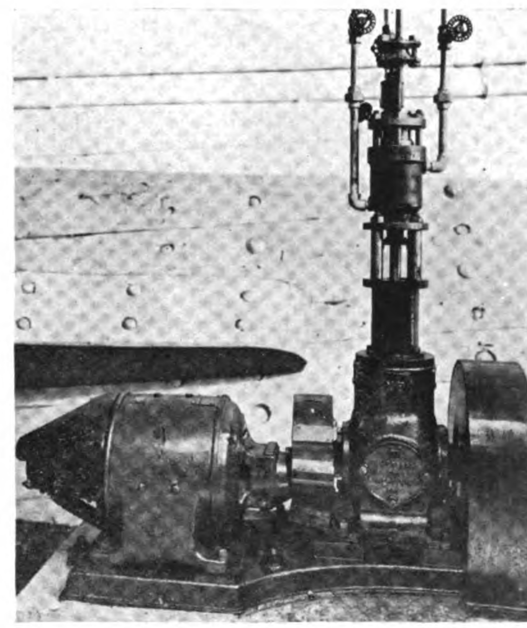
The two air-storage tanks are located on this flat, one on each side of the ship. Two Gould centrifugal circulating pumps with a capacity of 417 gallons per minute against a 40 ft. head, are also situated on the dynamo flat and are driven by a 7½ h.p. motor. These pumps handle the cooling-water for the pistons of the main engines. Either pump can serve both engines, and both are connected to the bilge lines. Directly aft of this group of machinery is a work room with a bench, vises, drill press and other equipment. The daily service tanks are located on the after engine-room bulkhead on the level above the dynamo flat. Fuel oil is pumped from the fuel tanks into these daily service tanks, whence it flows by gravity to the fuel lines through one of the twin fuel-oil strainers supplied by the Elliot Company of Pittsburgh, Pa. Above these tanks, on the level of the main deck are two Peterson Marine-type oil-filters, made by the Richardson-Phoenix Co., each having an hourly capacity of 400 to 800 gallons. Forced feed lubricators of the same make are used on the main engines, with sight feed delivery. One of the features of the lubricating system is the use of the oil strainer built by the Coen Company of San Francisco, who are de-



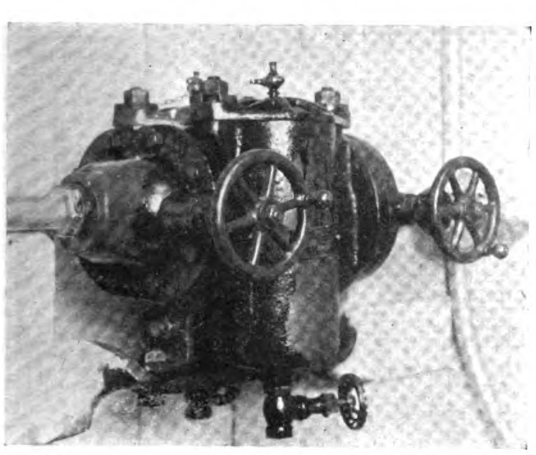
View of the daily service tanks and the Maxim silencer for the exhaust for the main and auxiliary engines



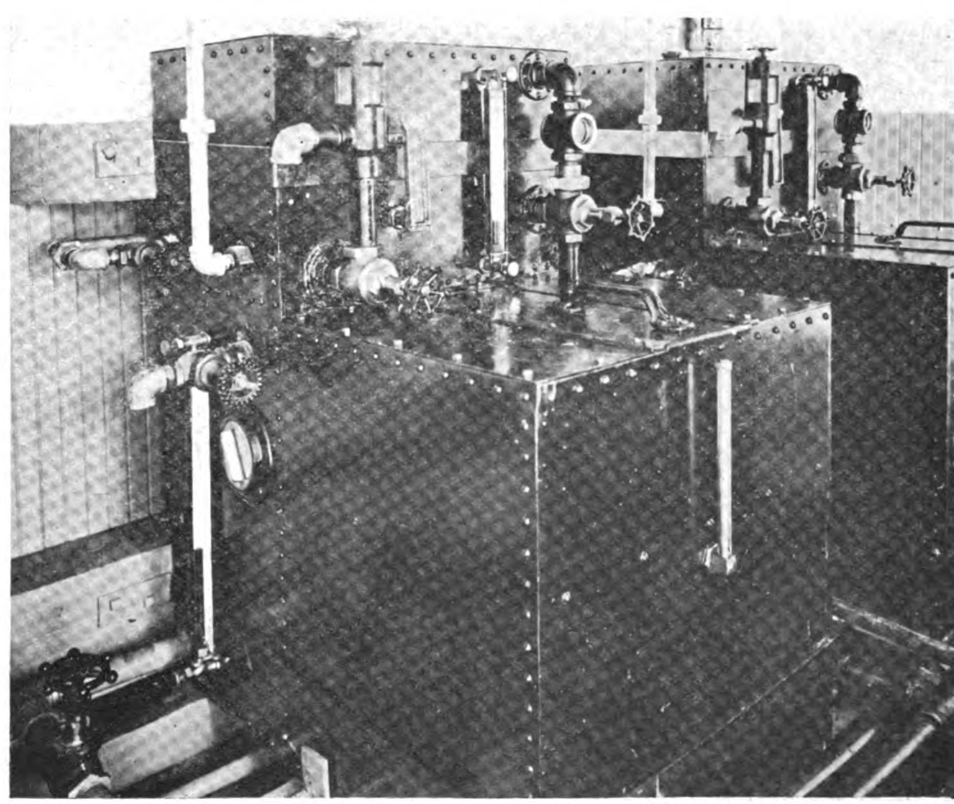
Two Fairbanks-Morse auxiliary generating sets, 37½ and 75 b.h.p., respectively. The switchboard designed and built by the Pacific Machine Shop & Mfg. Co., Seattle, may be seen in the background



Booster supplied with the Rix air compressor direct-connected to a 3 H. P. G. E. motor



Twin fuel-oil strainer supplied by the Elliott Co., Pittsburgh, Pa. One of these strainers is placed in the fuel line to each engine



The Richardson-Phoenix filters on the M.S. "Benowa." The filters and lubricators of this make are standard equipment with McIntosh & Seymour Diesel engines

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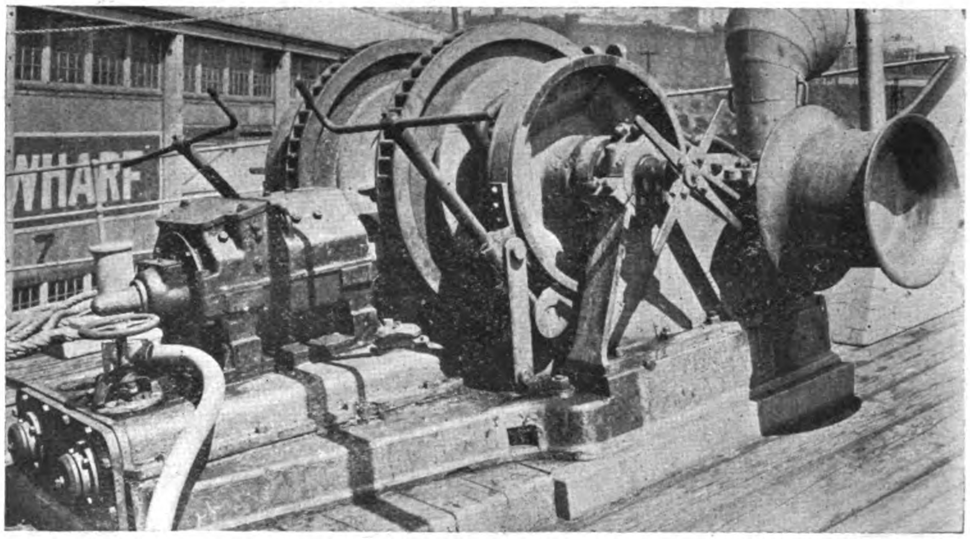
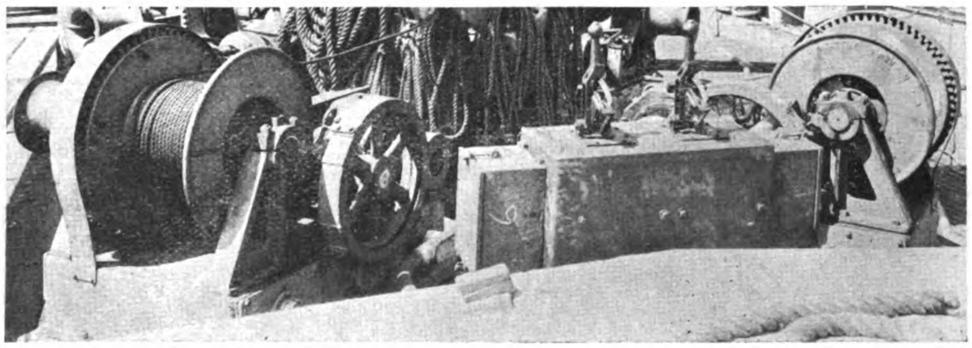
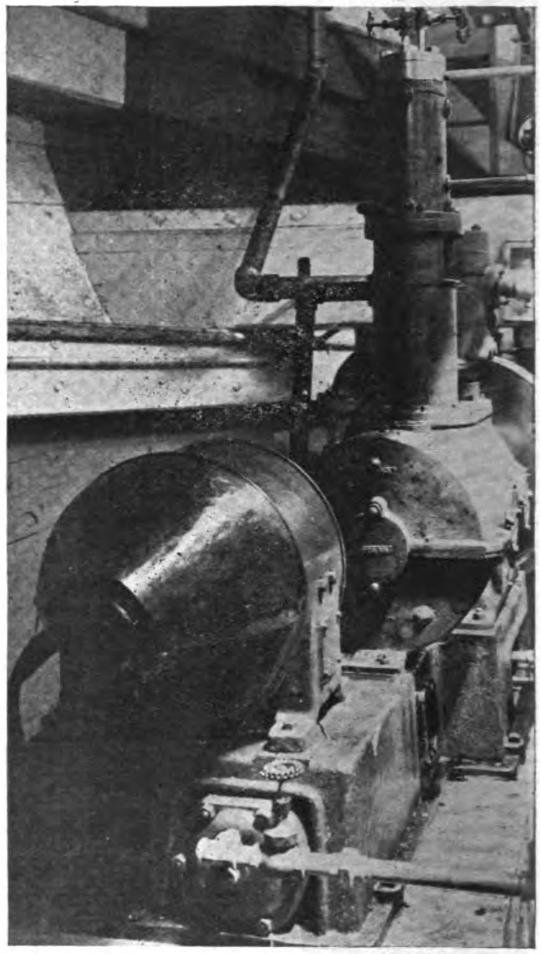


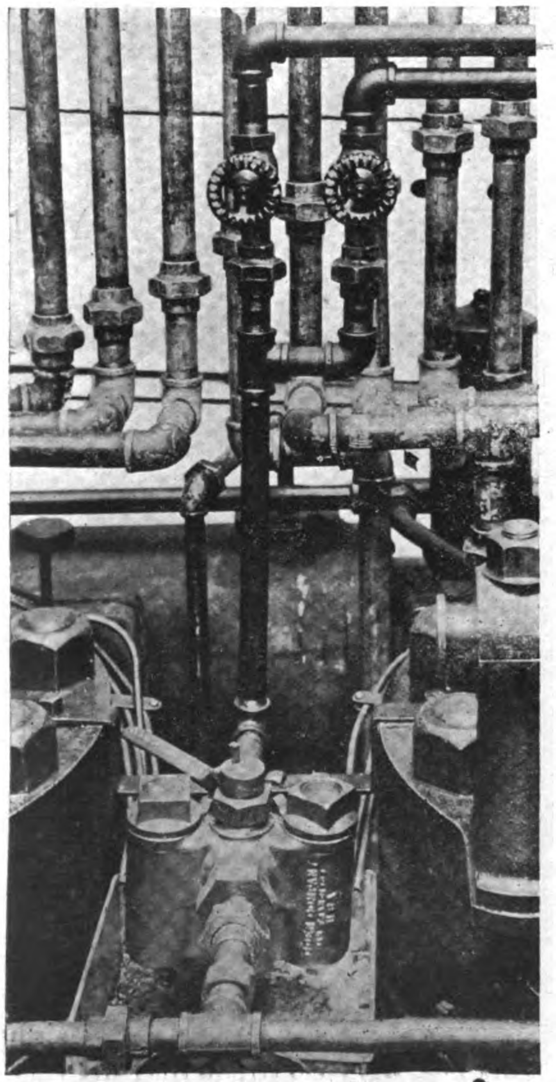
Electric anchor windlass on M.S. "Benowa"



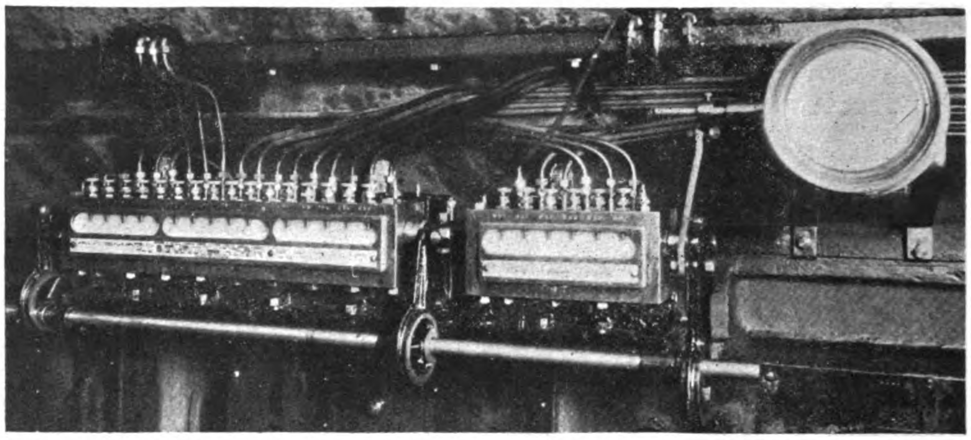
Elecric cargo winches. Note the control levers on top of the starting boxes. There are two such winches at each of the four cargo hatches



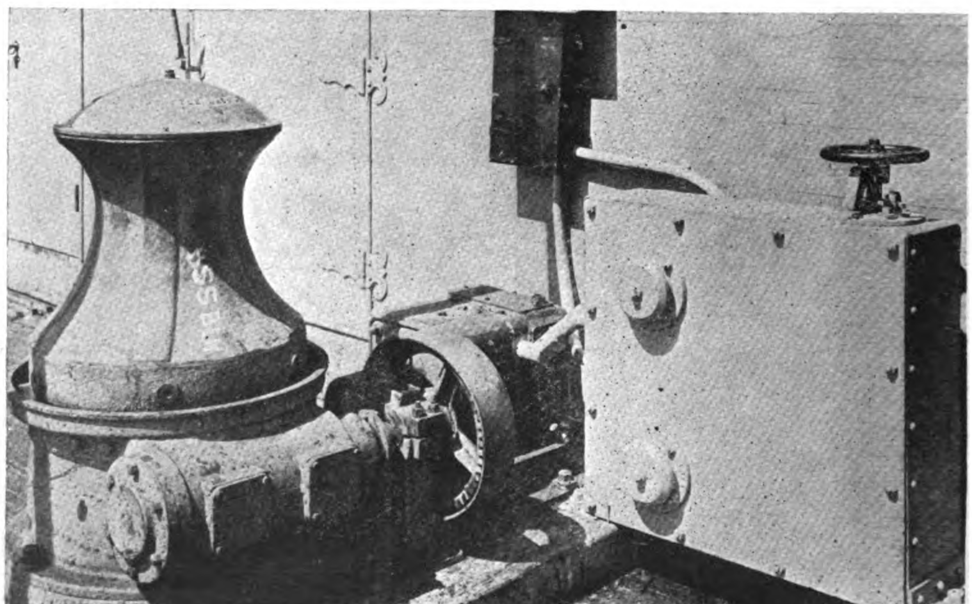
Rix auxiliary air-compressor, capacity 75 cu. ft. of free air per min. compressed to 350 lbs. per sq. in. at 350 r.p.m.



The Coen Filter mounted on the engine showing connections and the duplicate strainer boxes



View of Richardson-Phoenix forced-feed libricators one of sixteen feed and another six-feed. These lubricators are standard equipment on McIntosh & Seymour engines



One of the two electric-driven capstans on the full powered motorship "Benowa." All deck machinery is motor-driven

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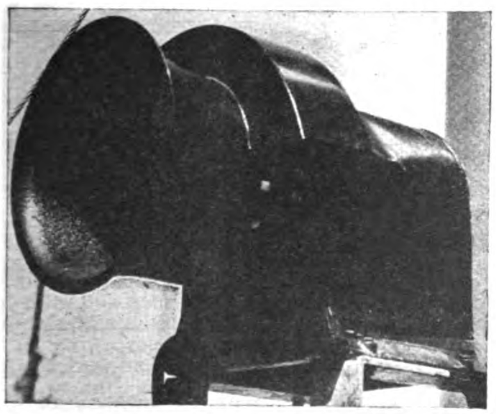
signers and manufacturers of oil burning equipment for steam boilers. The strainer is of the twin type, having two chambers into which the strainer baskets fit. A very practical feature of this device is the arrangement which permits of the cleaning of the strainers without interrupting the flow of oil. This is accomplished by a valve which diverts the flow into the desired chamber, leaving the other free for inspection and cleaning if necessary. The strainer is of brass, very neat in appearance, and is connected to the lubricating line at the top of the engine between the centre cylinders.

The Anchor Windlass has a combination spur gear and worm drive and is operated by a 25 h.p. General Electric Company crane motor.

The cargo winches have a single spur-gear drive from 15 h.p. crane motors. They are so arranged that one winch operator can handle two winches, and are fitted with automatic brakes which operate in case the power fails. The resistances are placed in a hollow base on the cargo winches. All exposed motors are water-tight.

The steering-engine is of the right and left-hand screw type, driven by a 5 h.p. motor. An electric telemotor is fitted, and the steering engine is con-



Electric syrene installed on the M.S. "Benowa"

trolled from the bridge through a shunt circuit from the motor. A "tell-tale" in the pilot house shows the position of the rudder at all times. The device consists of a number of small lamps arranged as a portion of a dial. The lamps indicate the position of the rudder relative to the center line of the ship in degrees, and as the rudder moves, a lamp in the dial lights denoting the angle which it makes with the centerline of the vessel. The steering-engine motor is fitted with limit switches which operate when the rudder has swung to its greatest allowable angle, stopping the motor and applying the brake.

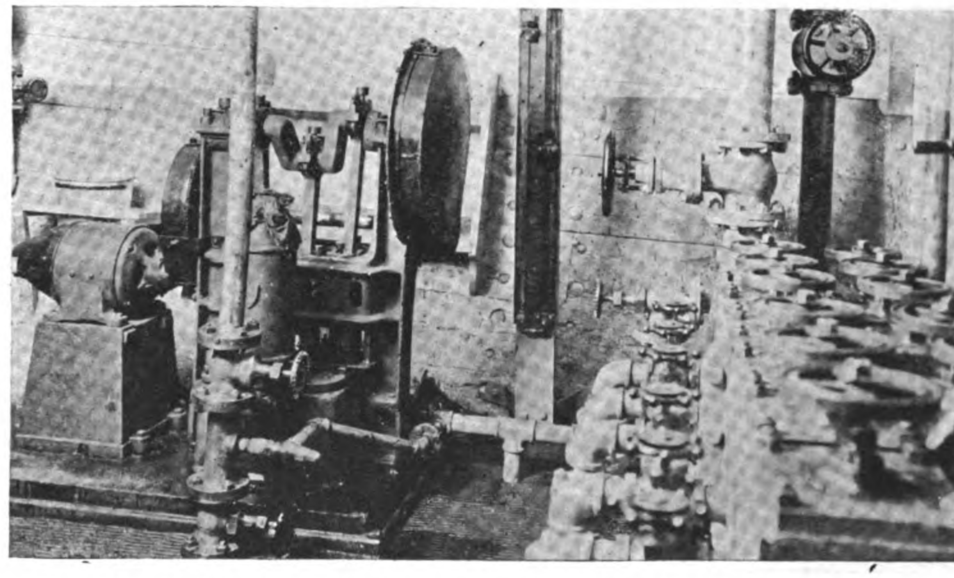
An electrical centrifugal siren, driven by a 1½ h.p. motor is fitted with switching devices to allow of a long or short signal as desired.

The engine room switch board, made up of two slate panels 76" high is fitted with all indicating instruments and safety devices. It is so arranged with double-throw switches that the load may be transferred from one generator to the other without the parallel motion being required. All the deck machinery, the steering engine, siren and switchboard were supplied by the Pacific Machine Shop & Manufacturing Company of Seattle.

Mr. H. H. Sanderson, the Supervising Engineer for the Australian Government, a man of large experience with both steam and oil-burning marine engines, gives some interesting comparative data on the two types. Mr. Sanderson has supervised the installation of both Diesel and Steam engines in ships built in the Pacific Northwest for his Government, and the figures here given form a very accurate basis of comparison, since the hull construction for the two types has been identical. It will be noted that in the matter of the weight of "tanks" and "freshwater" the steamer has the advantage. It is assumed that the steamer is equipped with evaporators which enter into the calculation as an element in the weight of "machinery." Therefore, the steamer will make her own freshwater, whereas the motorship will not. "On the trip from Seattle to Tacoma, where the Benowa is to load lumber, the vessel averaged 12.2 knots."

NEW LARGE AMERICAN DIESEL ENGINE

The New London Ship and Engine Co., of Groton, which has for many years been constructing submarine Diesel engines for the American Navy, of a type which was also built in this country during the war, is now engaged upon the design of a large slow-speed Diesel engine suitable for ordinary cargo ships. It is expected that it will be ready during the course of the present year.



View showing electric-driven Gould pump and also the system of manifolds

COMPARISON OF STEAM AND DIESEL ENGINED SHIP

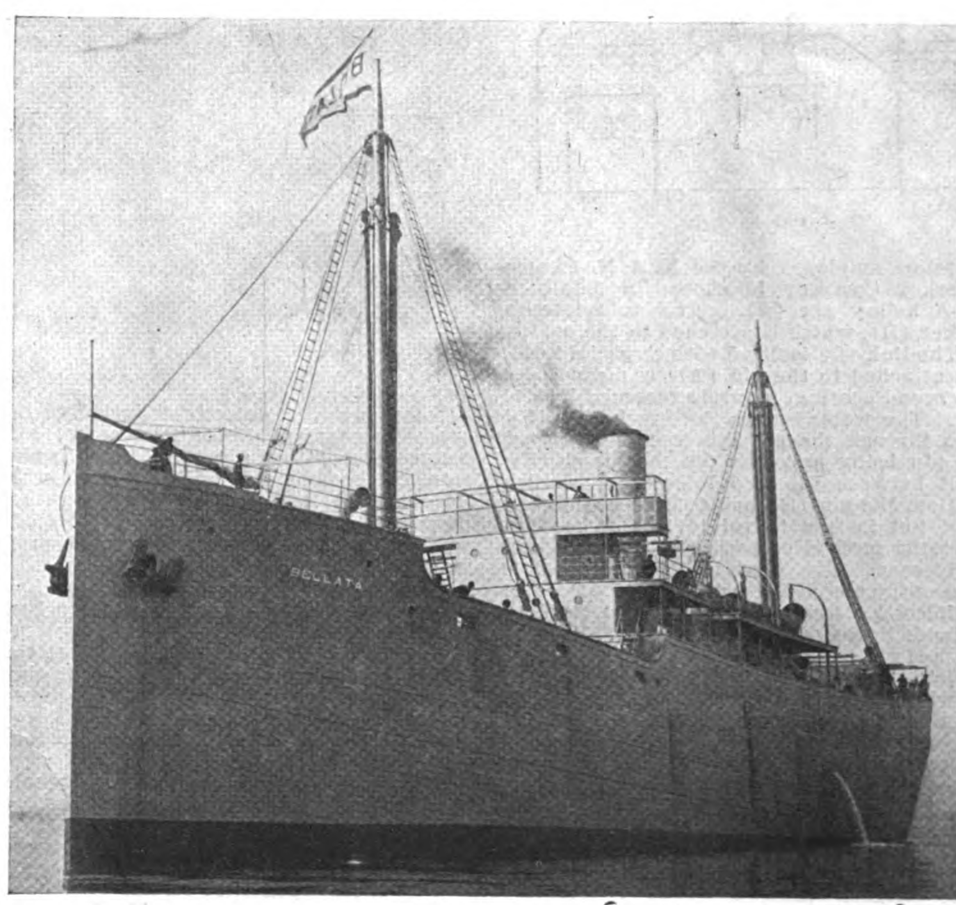
Item	Steamers	Motorships
Launching Displacement	2,004 tons	2,004 tons
Machinery	216 tons	158 tons
Tanks, (empty)	30 tons	104 tons
Fuel	(coal) 848 tons	(oil) 315 tons
Fresh water	55 tons	100 tons
Deck machinery, masts, stores, crew, effects	162	162
Total displacement (light condition)	3,315 tons	2,843 tons
Deadweight cargo carrying capacity	3,437 tons	3,909 tons
Difference in favor of motorships		472 tons
Cubic capacity of holds	160,140 cu ft	206,888 cu ft
Difference in favor of motorships		46,740 cu ft

A summary of the trial trip and hull data follows:

Loaded displacement ....6,883 Tons
Deadweight capacity ....4,441 Tons
Actual cargo capacity ....202,000 Cubic Feet
Weight of ship ....2,442 Tons
Fuel oil capacity ....93,200 Gallons (2330 bbls)
Length B. P..............................278'-9"
Molded breadth ....46'-10"
Molded depth ....27'
Horsepower B.H.P. 1000
Mean draft with full cargo....................26'
Average speed on trial ....10 knots
Number of propellers 2
No. blades ....3 each
Diameter, do ....8'-0"
Pitch, do ....6'-4"
Crankshaft diameter ....8"
Thrust block, Marine horseshoe ....
Kind fuel oil used ....0.24 gravity (Standard Oil Company Diesel Fuel Oil).
Kind Lubricating Oil ....Calol (Standard Oil Company)

Number revolutions per minute (average) ..183
Number of men in engine room staff 9
Fuel consumption per B.H.P. hour ....0.41 lbs.
Lubricating oil consumption ......8 gal. per 24 hr.

On the vessel during her trials were, Alex McDonald of the Patterson-McDonald Shipbuilding Company; H. H. Sanderson, Supervising Engineer for the Australian Government; Oscar Nielson, Guarantee Engineer, McIntosh & Seymour Corporation; Mr. Roderick, Chief Engineer Benowa"; Sven Strid, Erecting Engineer, McIntosh & Seymour; and Preston S. Stone, designer of hull; Robert R. Muir, Chief Engineer; Joseph Lane, Superintendent of Machinery, and Jas. Black, President; all of the Patterson-McDonald Shipbuilding Company; W. C. Collings, Lloyd's Surveyor at Seattle; and G. E. Sweet, of the Pacific Machine Shop and Mfg. Co.



View of the S.S. "Bellata" built by the Patterson-MacDonald Shipbuilding Co., Seattle, Wash. She is a sister ship to the M.S. "Benowa" but propelled by steam. Note the tabulated comparison of the two types of vessels given in the article herewith

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Piston and Valve Cooling in Diesel Engines

Problems That Arise and Examples of Designs Now in Use

(Concluded from page 35 of the July issue)

The second system which has been extensively employed on some designs of engines is the "walking tube," but owing to excessive wear in the joints it is almost impossible to prevent serious leakage, and in my opinion it is only advisable to use it in conjunction with an open crank-case, where the main-bearings are fed by gravity or ring oiling.

The walking-tubes usually consist of two links, one being attached to the frame at one end on a fulcrum, the second being attached to the crosshead, the other ends being pivoted together in such a manner that free rotational movement is provided, while at the same time the water may flow freely through the joints. The general arrangement of the system is shown in Fig. 8.

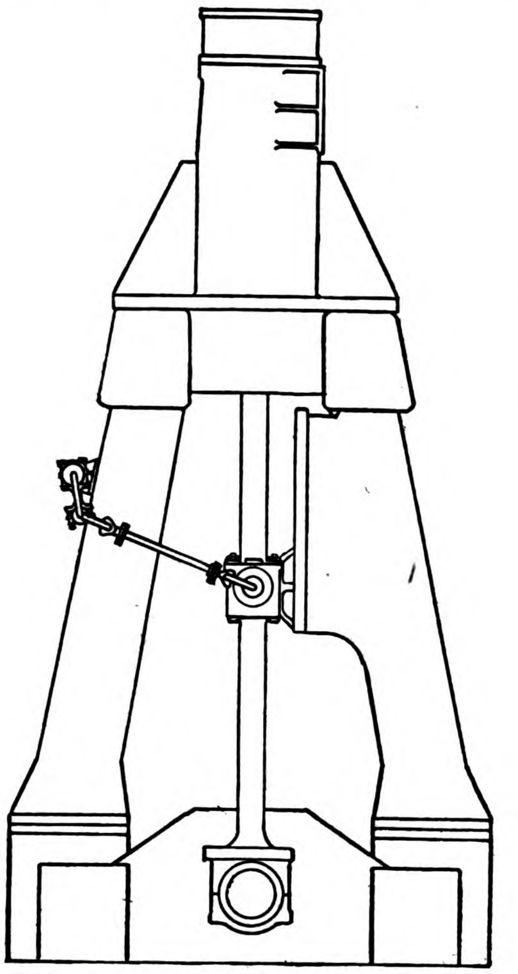

Fig. 8

The system employed by the M. A. N. (Augsburg Works) Company is shown in detail in Fig. 9. A hollow pin (A) is free to rotate in the bracket (B), which is attached to the engine frame. The link (C) is fitted with a special head, which is attached to the pin (A) by means of a conical ground seating, securely fastened by the nut (D). The water enters the bracket at (E) and flows through the pin into the link leakage past the pin being prevented by the gland (F). The joint between the two links is of similar construction, the pin (G) being clamped into the link (F), but is free to rotate in the head of link (C); the method of packing the glands can be clearly seen. The joint in the crosshead is the same as the one in the bracket.

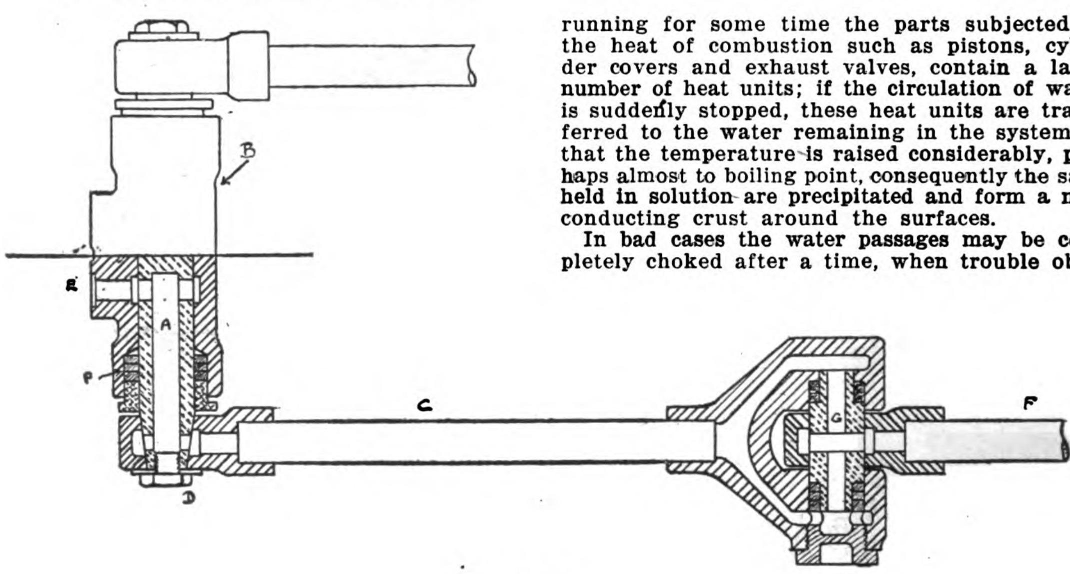

Fig. 9

The difficulty with this system is the packing of the glands in the central joint; when oil is the cooling medium as in the submarine engines, leakage is not very serious, but it is a source of trouble when using water.

Another system is shown in Fig. 10, which is rather more complicated. The central joint consists of two castings (A and B) provided with concentric collars which fit accurately, the two being held together by the nut (C). The castings have water passages cored-out as shown. The links consist of castings in which the water passages also are cored out and are bolted on to the joint castings (A and B) by four bolts. Water enters at (C) and passes into the passage (D) and thence into the other joint piece through the passage (E), from where it flows into the second link and into the crosshead; the return from the piston flows through the passage (F) and into the passage (G), thence through (H) and out by the pipe (K). Here again the difficulty is to keep the joint tight, as when wear takes place in the concentric spigot-rings, there is no means of compensating.

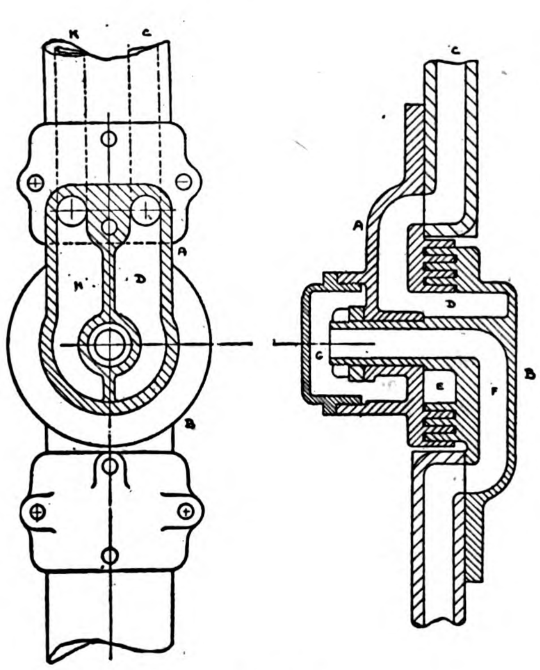

Fig. 10

When once the water is delivered to the crosshead, mechanical difficulties cease, since the water flows up the hollow rod into the piston and returns through a tube as shown in Fig. 11. Care should be taken in designing the piston head that no air pockets can be formed, which would cause local overheating and probably a cracked piston.

In Fig. 12 is shown a section through a piston of one of the large mercantile type two-cycle Fiat San Giorgio engines in the motorship "Ceara"; it will be noticed here that the water is delivered through the jet (A) on to the piston-crown; also note the large radius between the crown and the walls. The Fiat San Giorgio (now Ansaldo San Giorgio) high-speed engine piston-cooling device is shown in Fig. 17.

Regarding the question of using salt water for cooling pistons (as is the usual practice owing to economical reasons), the practice should be rigorously carried out of circulating the water through the system for some time after the engine has stopped until all the parts have ample time to cool down, as trouble from scale and other deposits will be largely reduced. It must be remembered that after an engine has been running for some time the parts subjected to the heat of combustion such as pistons, cylinder covers and exhaust valves, contain a large number of heat units; if the circulation of water is suddenly stopped, these heat units are transferred to the water remaining in the system so that the temperature is raised considerably, perhaps almost to boiling point, consequently the salts held in solution are precipitated and form a non-conducting crust around the surfaces.

In bad cases the water passages may be completely choked after a time, when trouble obviously occurs and cracked pistons and covers result. If the water is well circulated, however, this trouble can be nearly eliminated, as at low temperatures the deposit is very slight, or almost negligible. Wherever possible, such as in the case of stationary engines on land, fresh water should be used for the circulating system, owing to the decreased risk of these deposits and leakage into the lubricating oil; however, for marine work the use of fresh water necessitates considerable complications and extra tankage for carrying the fresh water. So more attention should be paid to the cleaning of water spaces in cylinder covers and pistons than is usually given to this most important operation during overhauling, as the extra time involved will probably save serious and costly delays.

Another point to be considered in discussing this question of circulating the water after the engine has stopped is that if the engine is started up again after a short interval, the heat will have caused the lubricating-oil on the surface to become thin and probably a lot will run

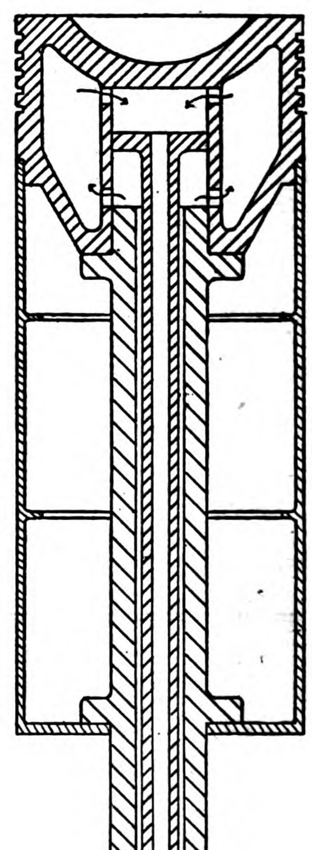

Fig. 11

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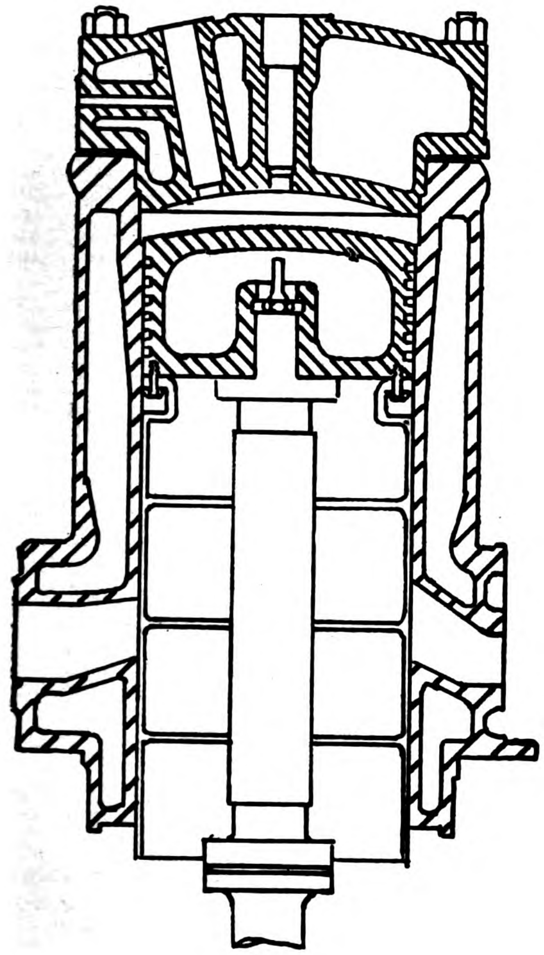

Fig. 12

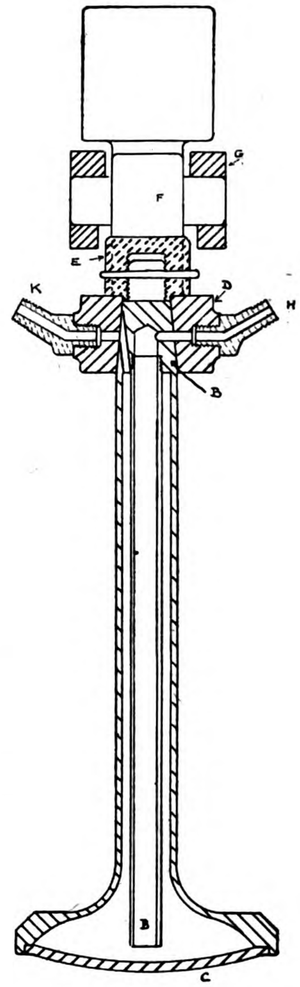

Fig. 13

down, leaving the piston nearly dry, in addition to which the heat will cause the piston to expand considerably, so that there is a tendency for it to seize if the designer has not allowed proper clearances. With trunk-pistons this danger is two-fold, as the heat from the crown tends to "dry" the gudgeon-pin, so that if this is not fitted with forced-lubrication, the gudgeon-pin will heat up when starting, and owing to its greater coefficient of expansion than the cast-iron, it will tend to distort the comparatively thin shell of the piston, when seizure takes place. However, all these are points which can be watched in advance by the engine designer and proper allowances made so that they do not occur in operation.

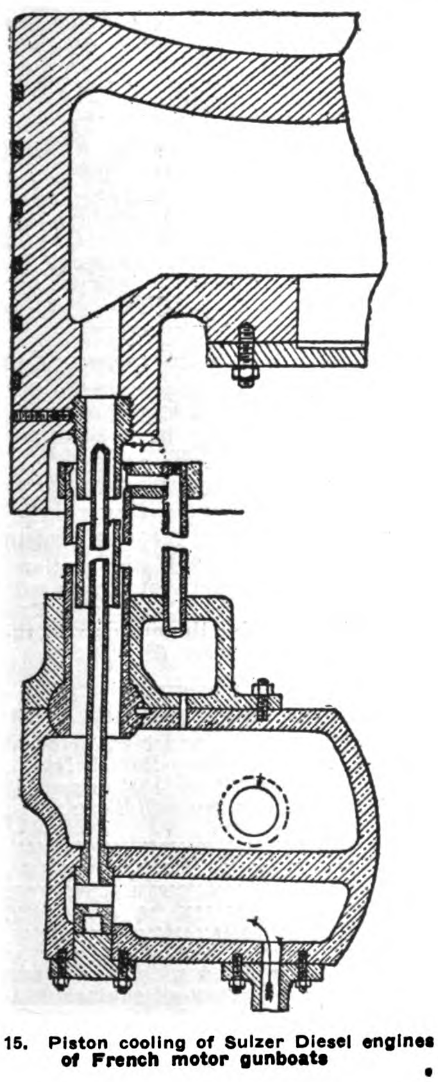

Fig. 15. Piston cooling of Sulzer Diesel engines of French motor gunboats

Exhaust valves being subjected to the action of high-velocity gases and also high temperatures naturally constitute a detail that requires considerable care in designing. Undoubtedly the best material to withstand the combined action of the heat and gases is close grained cast-iron. Steel burns very rapidly, and should not be used if possible. Above five inches in diameter, exhaust-valves will give far better results when water cooled, and it is my view that the extra cost of manufacture will be rapidly repaid in the longer life and reliability of the valve. A favorite point that is always raised by the steam-engine advocates when trying to retard the introduction of their new rival, the Diesel engine, is the question of exhaust-valves. They claim that they are unreliable and create a constant job for the engine-room staff in changing them and grinding them in. This is, of course, a pure fallacy.

The writer has for the last three years run a high-speed multicylinder engine under adverse conditions without the slightest trouble from exhaust-valves. In twelve months only one valve out of twelve was removed, and that only for inspection, when it proved to be in order. The valves would have run longer if the ship had not been in dock for an overhaul, when they were all taken out. The valves it might be added were water cooled; considering the great advantage of water cooling it is surprising that manufacturers do not fit this type of valve more often; even steel appears to be satisfactory for valves when it is water-cooled. A typical example of a water-cooled valve is shown in Fig. 13. The valve-head and spindle are formed in one piece (A), the spindle being hollow except at the top, where it is formed into a cone (B). A steel tube (B) is securely screwed into this cone piece, through the spindle, and is long enough to come down to the head of the valve. The latter is then closed up by means of the dished plate (C), which is welded round the edge.

Fitted on to the cone (B) is a bridge piece (D) which makes a water-tight ground joint with the spindle and forms a guide at the top to which the spring is attached. The bridge piece (D) is secured to the spindle by a case-hardened nut (E), on which the striker-block (F) operates through the levers (G).

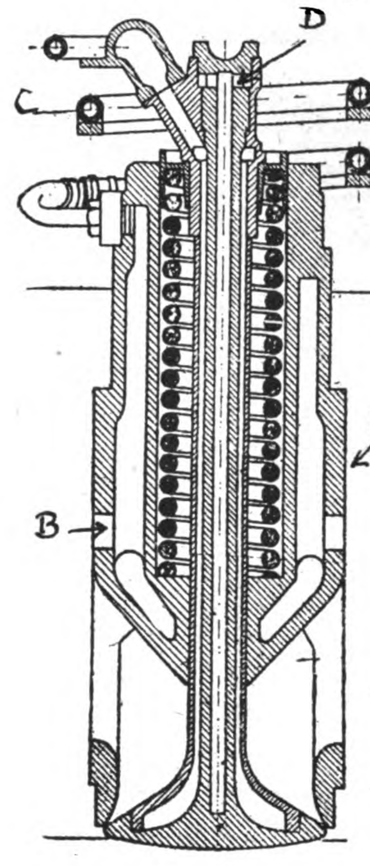

Fig. 14

Adapters (H and K) are screwed into (D), which are connected to the water service supply and discharge pipes by flexible hoses: the water enters at (H) and passes down the central tube to the valve head, and thence up through the annular space formed between the inner tube and the hollow spindle, and out through (K).

Not only is the valve-head kept cool, but also the spindle, which can consequently be a good working fit in its guide-bush. These valves are quite simple and there is nothing to get out of order. Should the passages become choked, it is usually possible to clear them by attaching a hose to one of the adapters and connecting it to the compressed-air supply. Here again the same remarks apply as to the piston-cooling system.

Always circulate the water well after stopping the engine. Should a new tube require to be fitted, a hole can be drilled in the bottom and the old one taken out, the new one substituted, and the hole can then be welded up.

Another type of valve is shown in Fig. 14, where it will be seen that the inner tube is formed with the head, the spindle being formed by a separate tube which also forms the cover of the valve. The circulating-water passes from the cylinder cover into the valve casing (A) through the passage (B); from the casing it flows through the flexible pipe (C) into the hollow spindle, whence it passes to the valve head and up through the central passage (D) to the outlet.

While there are many other types of valves which vary in detail, the general principles are the same. Inlet valves do not require to be water cooled, as the stream of high-velocity cold air drawn through on the suction stroke provides the necessary cooling.

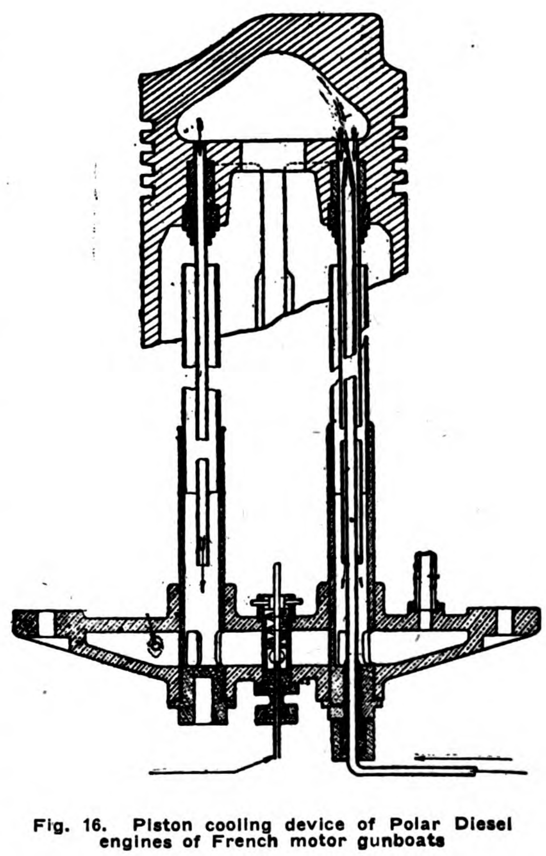

Fig. 16. Piston cooling device of Polar Diesel engines of French motor gunboats

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Interesting News and Notes from Everywhere

AUXILIARY SCHOONER BUILDING AT WILMINGTON, DEL.

The auxiliary four-master schooner, "Chas A. Gawthrop," of 2,000 tons d. w. c., is scheduled for launching at the Jackson and Sharpe plant at Wilmington, Del., about August 1st. This vessel will be a Winton-engined ship, having twin 400 H. P. eight-cylindered engines. We understand that these engines are similar to the 500 H.P. Winton model, but that the revolutions are cut down to 210 per minute.

This vessel is a sister-ship to a previous schooner which, however, carries all sail and thus indicates another convert joining the swelling ranks of those companies who have been reading the writing on the wall.

A few particulars of this vessal are:

L. O. A.	230 ft., 3 in.
L. W. L.	210 ft., 6 in.
L. B. P.	210 ft., 0 in.
Beam Molded	39 ft., 0 in.
Depth	24 ft., 2 in.
Fuel Capacity	32,000 gals.
Speed	7½ knots
Classification	Lloyds and Am. Bur.

The first vessel, named the "Woodin," carries 1,891 tons of coal and 20 tons of dunnage lumber. These ships are owned and operated by the American Car and Foundry Co., who also control the Jackson & Sharpe Plant at Wilmington. We hope in an early issue to publish photographs and further particulars of this vessel, the plans of which are from the office of Tams, Lemoine & Crane, New York City.

NEW AUXILIARY MOTORSHIPS IN HOLLAND

The four-masted auxiliary-schooner "Bovenharspel" has been built for N.V.S.V. Mij: Europa by Messrs. Wortelbar & Co. of Westerbroek, Holland. This vessel has a length of 165 feet and 28 feet breadth, with a net tonnage of 415, gross tonnage 615, dead weight capacity 950 tons. She is powered with a four-cylinder Kromhout crude-oil motor and has a fuel capacity of 30,000 liters (198 bbls.).

The auxiliary two-masted schooner "Kwiek" 122 ft. long by 23 ft. by 11 ft. and at 450 tons d.w.c. has been delivered to N.V. Mij; Hoogenzand. Her tonnage measurements are gross 315 tons, and net 226 tons. She has a two-cylinder 90 h.p. heavy oil engine and was built by Gebr. Boedewes at Martenshoek.

Another auxiliary-schooner the "Rolse" rigged as a two master, 101 ft. long, 25 ft. beam and 10 ft. deep has been ordered from Gebr. Pob by Hoid and Evensen of Aarhus. Her capacity will be 343 tons d.w.c. and the power will be a 90 h.p. two-cylinder Bolnes crude oil motor.

FUEL CONSUMPTION OF DIESEL ENGINES

In a paper read before the Institution of Marine Engineers, Mr. John Houston stated that the fuel-consumption of the Diesel engine is 0.47 lb. per b.h.p. We would like to know where Mr. Houston obtained his figures. We have inspected about 50 large ocean-going Diesel engined motorships and none of them (including those fitted with two-cycle engines) have had a fuel-consumption of over 0.44 lb. and the majority have had a consumption of 0.40 lb. per b.h.p. or 0.30 to 0.32 lb. per i.h.p. The Vickers solid-injection Diesel engine has a consumption of 0.38 lb. per b.h.p. or 0.28 per i.h.p. These figures show quite a difference from Mr. Houston's figures of 0.47 lb.

DIESEL ENGINE CO. INCREASES REPRESENTATIVES

Four new offices have been opened by the Midwest Engine Co. of Indianapolis, Ind., in various ports along the Atlantic and Gulf coasts to stimulate the growing interest in Diesel and surface-ignition engines.

In New York City, Mr. B. H. Downing has been appointed Eastern Sales Manager with offices at 111 Broadway.

Mr. D. J. Carrison will represent the company at Jacksonville, Fla. with offices in the Florida Life Bldg.

The southwest district embracing Western Texas, Arizona, New Mexico, and Southern California will be in the hands of Mr. Chester B. Loomis at 303 Caples Bldg., El Paso.

Mr. J. R. Lowe will represent the Midwest products in the South with offices at 617 Maison Blanche Bldg., New Orleans, La.

AMERICAN MOTORSHIP FOR BELGIUM

The Sumner-engined wooden motorship "Gaby" recently built by the Grays Harbor Shipbuilding Co. is owned by Belgian shipping interests.

OLD ITALIAN SHIP CONVERTED TO MOTOR POWER

Two heavy-oil engines have been installed in the 2000 tons d.w.c. Italian ship "Antonio Padre," which was built in 1902. She is owned by the Soc. Anon. Gaslini & L. Frigerio & Co. Shipowners, Genoa.

DUTCH AUXILIARY "CARY"

The Scheepvart Mij. "Poseidon," Shipowners, Rotterdam, have taken delivery of the 600 tons d.w.c. Bolnes oil-engined schooner "Cary," built by Gebys Tak. Geertruidenberg.

DOUBLE-ACTING SUBMARINE ENGINES

Some of the smaller German submarines are driven by four-cycle type double-acting direct-reversible Diesel engines, built by the M.A.N. These engines develop 850 b.h.p. each at 450 r.p.m. from eight-cylinders. On trials the U-boats in which they were installed developed a little over 17 knots. Some even smaller craft have two six-cylinder, double-acting direct-reversible M.A.N. Diesel engines of 450 b.h.p. at 500 r.p.m. As these engines are double-acting, they probably are very compact pieces of machinery.

MOTORSHIP AND TEXAS FUEL-OIL

The 1,500 b.h.p. solid-injection Diesel-engined tanker "Trefoil," owned by the British Admiralty, has used Texas fuel-oil for two years with most excellent results, without any break in her regular operation.

NORWEGIAN MOTORSHIPS

According to Mr. Otto Kahrs, Christiania, there now are on order for Norwegian owners nine motorships of 48,150 tons d.w.c., which will be fitted with 17 Werkspoor Diesel engines aggregating 26,625 i.h.p.

MORE NORWEGIAN AUXILIARIES

A number of 800 tons motor-auxiliary wooden ships are being built at the shipyard of the Västerviks Nya Varvsaktiebolag at Västervik, Norway.

GERMANY AND EUROPEAN SHIPYARD TRADE

We note that German shipyard-tool manufacturers already are advertising prominently in the Norwegian shipping publications.

CAPACITY OF SMALL MOTORSHIPS

The little Lake-built motorships "Lake Oneida" and "Lake Mohawk," each have a capacity of 175,-750 cubic feet of grain cargo, yet, they are only 261 ft. long O.A. by 43 ft. breadth and 26 ft. depth. We suggest that shipowners whose steam vessels are of this size compare their cargo capacities with the above. These two motorships were built by the Manitowoc Shipbuilding Co. of Manitowoc, Wisc.

AUXILIARY SHIP "ELSA"

A four-cylinder Bergsund marine oil-engine of 185 b.h.p. has been installed in the new 700 tons d.w.c. Scandinavian auxiliary ship "Elsa," built at the Norrkoping Shipyard.

LARGE MOTORSHIP IN MESOPOTAMIA

Some time ago the 14,750 tons displacement British motor-tanker "Santa Margherita" cruised up the Shatt-el-Arab river to Basrah. She was the largest Diesel-driven vessel ever in these waters.

CARRYING CLOTH FROM ENGLAND TO BELGIUM

A 43 ft. motorboat is used for carring cargoes of cloth from Leeds to Brussels by Albrecht & Albrecht of the first named city. A 35 h.p. kerosene engine is installed.

OIL WELLS IN ENGLAND

Oil of an excellent grade has been obtained from a well in Hardstaft, England. It has a paraffin base and contains napthenes. Analysis shows its contents to be as follows:—

Motor spirit	7½ percent
Kerosene	39 "
Gas oil	20 "
Lubr. oils	30½ "

From the above it may be concluded that its fuel oil content, derived from gas oil, will be low; but nevertheless, valuable to Great Britain.

THE GERMAN EMERGENCY FLEET

When the peace terms are fully carried out, the tonnage registered at Hamburg will be reduced from the pre-war figure of 764 steamers of 2,600,000 gross tons to 128 steamers of 82,700 gross tons. We wonder how many steamers will be built by Germany to replace the loss in cargo tonnage. Will she discard her experience and past successes—though ill chosen—with the oil engine? We doubt it.

STRAIGHTENING A SHIP'S KEEL

The S.S. "Curaca" which was sunk in the munition explosion in Halifax Harbor, sustained an extensive fracture of nearly all her longitudinal plating amidships and developed a deep sag—her draft ford being 9'-2" and at the stern 6'-6" less than amidships. When placed in Robin's Dry Dock at Erie Basin, Brooklyn, N. Y. C., the top side plating and framing were burned apart as the vessel settled on the keel blocks—the burning continuing as the water level was lowered. The final result was that the two halves rested full length on the blocks separated by a wedged shaped cut amidships.

All structural members that were burned were replaced—54 of her bottom plates needed repairing or renewing.

The S.S. "Lord Dufferin" which was rammed and sunk in the upper bay New York Harbor, recently by the S.S. "Aquitania" was raised and repaired at this yard also.

GREAT MARKET FOR HEAVY-OIL ENGINES

An idea of the enormous market there is for well-designed and built marine heavy-oil engines can be gleaned from the fact that there already are over 13,500 Bolinder surface-ignition heavy-oil engines in service totaling about 650,000 b.h.p. in various parts of the world.

STANDARD DANISH COASTWISE MOTORSHIPS

For the purpose of constructing small steel motorships from standard plans for the coastwise trade, the Kalundberg Shipyard has been completed at Kalundberg, Denmark, and the first of these vessels is in the service of the Falcon Shipowning Company. The "Sirius," as she is named, is of 250 tons d.w.c., has a speed of 8 knots, and is propelled by two Alpha surface-ignition type heavy oil-engines.

CONVERTING DUTCH BARGES

Two steel sailing-barges built in Holland of 200 tons, respectively, are being converted to motor-power at Ipswich, England. In one boat two Dan four-cycle type surface-ignition heavy-oil engines of 90 b.h.p. each are being installed, while two 45 b.h.p. Dan engines are being fitted in the other.

THE STILL-ACLAND MARINE ENGINE

The builders and licensees of the Still-Acland combination Diesel and steam engine described and illustrated elsewhere in the July issue are The Engine Development Company, Ltd., 7 Princes Street, Westminster, London, S. W. England.

ANOTHER BRITISH ENGINE EXHIBITION

An exhibition of marine and stationary gasoline and oil motors and motorboats will be held at the Olympia, London, W., during February or March of 1920, under the auspices of the Society of Motor Manufacturers & Traders.

DANISH MOTOR MINE-LAYERS

Two 200 tons motor-driven mine-layers are now in the service of the Danish Navy, and one named "Minekran V" and "Minekran VI."

Their dimensions are as follows:

Displacement	198.5 tons
Length, b.p.	88 ft.
Breadth	20 ft. 6 in.
Draught (forward)	5 ft. 10 in.
Draught (aft)	6 ft. 6 in.
Power	290 b.h.p.

Each vessel is fitted with two Bergsund surface-ignition type heavy-oil engines of 145 b.h.p. apiece, each motor having four cylinders, 11.4 ins. bore by 13 ins. stroke, turning at 160 R.P.M.

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Hints and Tips for Oil-Engine Designers

Calculating Compressions and Size of Liner for Adjusting Compressions in the Diesel Engine

By W. H. SPRINGER

IGNITION by compression is not the only advantage in the Diesel engine. There is a far greater one, and that is the use of high compressions, which this sort of ignition makes possible. It is probable that at first Dr. Diesel was not concerned with the kind of ignition to use but rather with how he could use a high precompression cycle which suggested to him the ignition now in use in his engine. A high precompression increases the thermal efficiency of an internal combustion cycle considerably, so much so, that the less efficient Diesel cycle becomes more efficient with its high precompression than the more efficient Otto cycle, where only a comparatively low compression can be used due to danger of preignition of the mixture. The question of accurately knowing the compressions maintained when the engine is running therefore becomes important. It is considered that a reduction of 25 lbs. in the compression from the usual 30 or so atmospheres carried means a decrease in the thermal efficiency of the cycle of over one per cent, decreasing the power of the engine a somewhat similar amount. A set of curves given below shows the calculated efficiencies in percent for different compressions at various amounts of heat addition per pound of gas.

The usual method of determining the compressions by taking a pressure card on a cold engine turned over by motor does not insure accurate indication of what takes place when the engine is firing because of the different conditions under which compression is taking place. Where the motor is not installed the method of cutting off the fuel momentarily from a cylinder certainly is not salutary and, especially so, in very large engines if done every time compressions must be taken, and besides, the engine will not be up to its proper speed for taking compressions with one cylinder missing. A method by which compressions can be calculated and adjusted by liners also calculated, by including the conditions under which compression takes place when the engine is firing and cooling water going through the jackets will undoubtedly give more accurate results and greater satisfaction, in more thoroughly knowing some of the obscure points about a running engine.

To adopt a method of adjustment and reading of compressions by calculations, it will first be necessary to calculate a somewhat permanent factor which can be called the "clearance volume standard" to be used in the initial calculation. This factor will take different values as adjustments in compression are made, and can be originally found from the relation

$$PV^{n} = \text{a constant}$$

n taking a value of 1.41 for air compressed in a cylinder surrounded with cooling water.

When the cylinder is newly fitted and known to be practically air tight around the valves and past the rings, with a compression somewhere near that required, an indicator card is taken of the intake and compression only, that is, without firing the cylinder and cooling water shut off. This will give the pressure at beginning of compression which we will designate as Pa, and pressure Pb at end of compression. From this data we will find the clearance volume of the cylinder, which is to be used as a starting point of the calculations.

Let V = stroke-volume of cylinder in cu ft. = Area of piston in sq. ft. times stroke in feet.

X = clearance volume in cu. ft.

then

$$Pa\,(V+X)^{1.41} = Pb\,X^{1.41}$$

and

$$X = \frac{V\left\{\dfrac{Pa}{Pb}\right\}^{\frac{1}{1.41}}}{\left[1-\left\{\dfrac{Pa}{Pb}\right\}\right]^{\frac{1}{1.41}}}$$

When this value has been obtained for each cylinder it is to be changed every time compressions are changed by adding or subtracting the volume change caused by the adjusting liners which is $\dfrac{at}{1728}$, where a is the area of piston in sq.in. and t is the thickness of the liner in inches. By doing this the clearance volumes of the cylinders will be kept up to date. It will not be necessary to calculate clearance volumes any more unless there is cause to believe that the volume of the cylinder may have changed in time due to wear or lifting of cylinder.

A better method of obtaining the clearance volume is to measure the quantity of water in cubic feet held by the cylinder when the piston is on top center. This method is to be preferred to calculating the clearance volume since the value of n as given (1.41) accounts only for heat losses due to conduction and not to any leakage of air which as a rule there is bound to be. Finding the clearance in this manner brings out the added advantage of knowing precisely what takes place during compression if an indicator card of the compression is taken, from which the value of n may be calculated by means of formula (2) (given below) showing whether any excessive heat losses occur that may be attributed to leakage. For instance if a value of about 1.8 were to be found for n in compression it would indicate that air is leaking somewhere since if heat were carried away by cooling water only, the value of n would ordinarily be around 1.5 to 1.6.

Whenever it becomes necessary to get compressions an indicator card can be taken when the cylinder is firing. The card will then show a compression line made under actual conditions and from this line values are found which will in a measure depict the conditions taking place in the cylinder. These values taken at intermediate points in the compression can be used to find what the final compression actually is if it can not be accurately read off the indicator card which is usually the case. The value to be found from the indicator card that has been taken when the cylinder fired is that of the exponent n in the relation PV^{n} = a constant, since the value of n depends on the amount of heat transferred from or to the air while compressing under actual working conditions. To find this, any two points on the compression curve are chosen each preferably taken near the ends of the stroke. The pressure and corresponding volume are found for each point giving Pa and Va for one point near the beginning of compression and Pb and Vb for the point near the end of compression. Now according to the gas law:

$$Pa\,Va^{n} = PbVb^{n}$$

and

$$\text{Log } Pa + n \text{ Log} Va = \text{Log} Pb + n\text{Log} Vb$$

therefore

$$n = \frac{\text{Log}Pa - \text{Log}Pb}{\text{Log}Vb - \text{Log}Va} \quad \ldots\ldots\ldots\ldots(2)$$

Va and Vb are the total volumes over the piston on positions Va and Vb respectively including the clearance volume X previously found, which was explained in a foregoing paragraph. Now letting Pc = pressure at end of compression,

$PatVat^{n} = Pc\,X^{n}$ Pat and Vat being the PV values at the beginning of compression and

$$Pc = Pat\left\{\frac{V+X}{X}\right\}^{n} \quad \ldots\ldots\ldots\ldots(3)$$

where the value of Pc will be a true value of the compression. If Pc is found to be different from that required, the value of n depicting the true condition in a working cylinder can now be used to calculate the proper size liner to raise or lower the piston. Now

$$Pat\,Vat^{n} = PcX^{n}$$

but Va = v the stroke volume + X the clearance volume, therefore

$$Pat\,(V+X)^{n} = PcX^{n} \quad \ldots\ldots\ldots(a)$$

Let it be required to reduce or increase the compression by an amount $\triangle Pc$. This will require a change in the clearance volume by an amount $\triangle x$. Then the size of liner required to be put in or taken out will be

$$\frac{\triangle x}{\text{Area of piston.}}$$

The evaluation of $\triangle x$ follows: After having made the adjustment of X by the amount $= + \triangle x$, equation (a) becomes

$$Pat\,(V + X + \triangle x)^{n} = (Pc - \triangle Pc)\,(X + \triangle x)^{n}$$

and

$$\left\{\frac{(Pat)}{Pc - \triangle Pc}\right\}^{\frac{1}{n}} = \frac{V + X + \triangle x}{X + \triangle x}$$

$$\triangle x = \frac{X\left[\left\{\dfrac{Pat}{Pc - \triangle Pc}\right\}^{\frac{1}{n}} - 1\right] - V}{1 - \left\{\dfrac{Pat}{Pc - \triangle Pc}\right\}^{\frac{1}{n}}}$$

Summarizing the foregoing we have the formula:

Letting Pc = recorded compression.

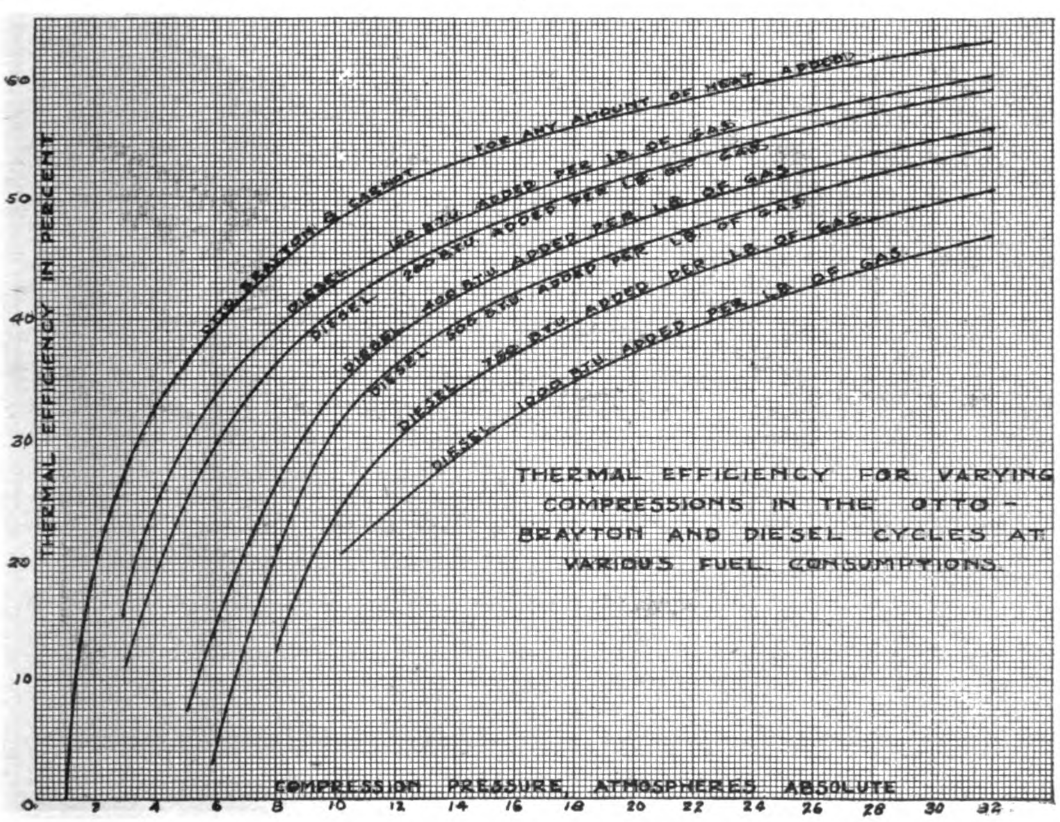
Pat = pressure at beginning of compression (usually below atmospheric).

$\triangle Pc$ = the amount required to raise or lower compression.

($\triangle Pc$ will take a negative value if required to lower compression).

V = stroke volume in cu. ft.

X = clearance volume in cu. ft.



THERMAL EFFICIENCY FOR VARYING COMPRESSIONS IN THE OTTO-BRAYTON AND DIESEL CYCLES AT VARIOUS FUEL CONSUMPTIONS.

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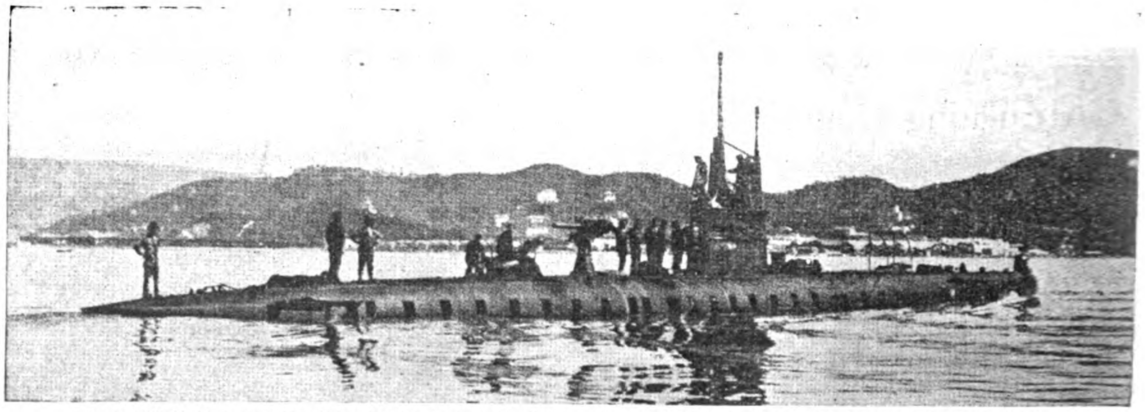
n = value found from indicator card as shown by logarithmic formula.
A = area of cylinder in sq. ft.
T = thickness of liner in inches
then

$$T = \frac{12}{A} \frac{X\left[\left\{\frac{Pat}{Pc - \Delta Pc}\right\}^{\frac{1}{n}} - 1\right] - V}{1 - \left\{\frac{Pat}{Pc - \Delta Pc}\right\}^{\frac{1}{n}}}$$

The inadvisability of reading the compressions directly from an indicator card taken on a firing cylinder is enhanced by the fact that due to the admission of fuel before the piston has completed its stroke there may be some constant volume heating that will further raise the pressure of the gas. This would ordinarily be mistaken for compression, and is another reason for calculating the compression, when compressions taken on a cold engine or choked off cylinder are to be deemed uncertain. The method may not be worth the trouble on small engines apparently, but after the start has been made and a data record kept of cylinder clearances, much cut and try work will be saved later on, especially when considered that a small engine cannot be so accurately designed for thermal effects. These often varying considerably from the designed object when the engine is completed. Here the method has its merits. In large engines with an output around a 1000 H. P. the advantage is not a mean one when slight uncertainties in the compression will mean a loss in power of 10 to 15 indicated horsepower. The question of compression here becomes vital and even if calculation does not reveal any wide discrepancies from the usual try-out methods, it will be a means by which the engine may be standardized and other information gleaned from it, such as whether or not too much cooling takes place by judging the kind and behavior of the curve. A curve having the value of about 1.8 for n would certainly indicate too much cooling during expansion, where it really should be at least 1.35, the value of about 1.8 for the compression causing less negative work, not being enough to off-set the greater loss of positive work in the 1.8 expansion. However, the greater degree of certainty in the operation that has been rationally checked up by mathematical analysis makes for better output and tends to co-operation with the designer on whose shoulders much of the blame for malperformance is placed, that should be shared by the operator making him truly his brother designer's keeper.



A small Italian submarine of the Laurenti type. Note the 3" gun aft of the conning tower.

CANADIAN BUILT MOTOR SCHOONER FOR ITALY

During the war a large number of wooden auxiliary-schooners were built in the United States for Italian interests, and some were built in Canada. One recent vessel is the three-masted motor schooner "Primero," built for Messrs. Clarialdo Deveto fu G.B., of Genoa, Italy, by the Annapolis Shipping Co. of Annapolis Royal, Nova Scotia, Canada, and equipped with two 100 b.h.p. Fairbanks-Morse heavy-oil engines. Her dimensions are as follows:

Length O. A.	185 ft.
Length on keel	145 ft.
Breadth	35 ft.
Depth of hold	13 ft.
Moulded depth	15 ft.
Gross tonnage	650 tons
Net tonnage	590 tons

Her motors drive bronze propellers made by the Hyde Windlass Co. of Bath, Maine. According to Mr. L. D. Shapiero of her builders, the "Primero" attained a speed of 8½ knots on her trial trip, which took place on Dec. 11th last.

MOTOR COASTER LAUNCHED IN HOLLAND

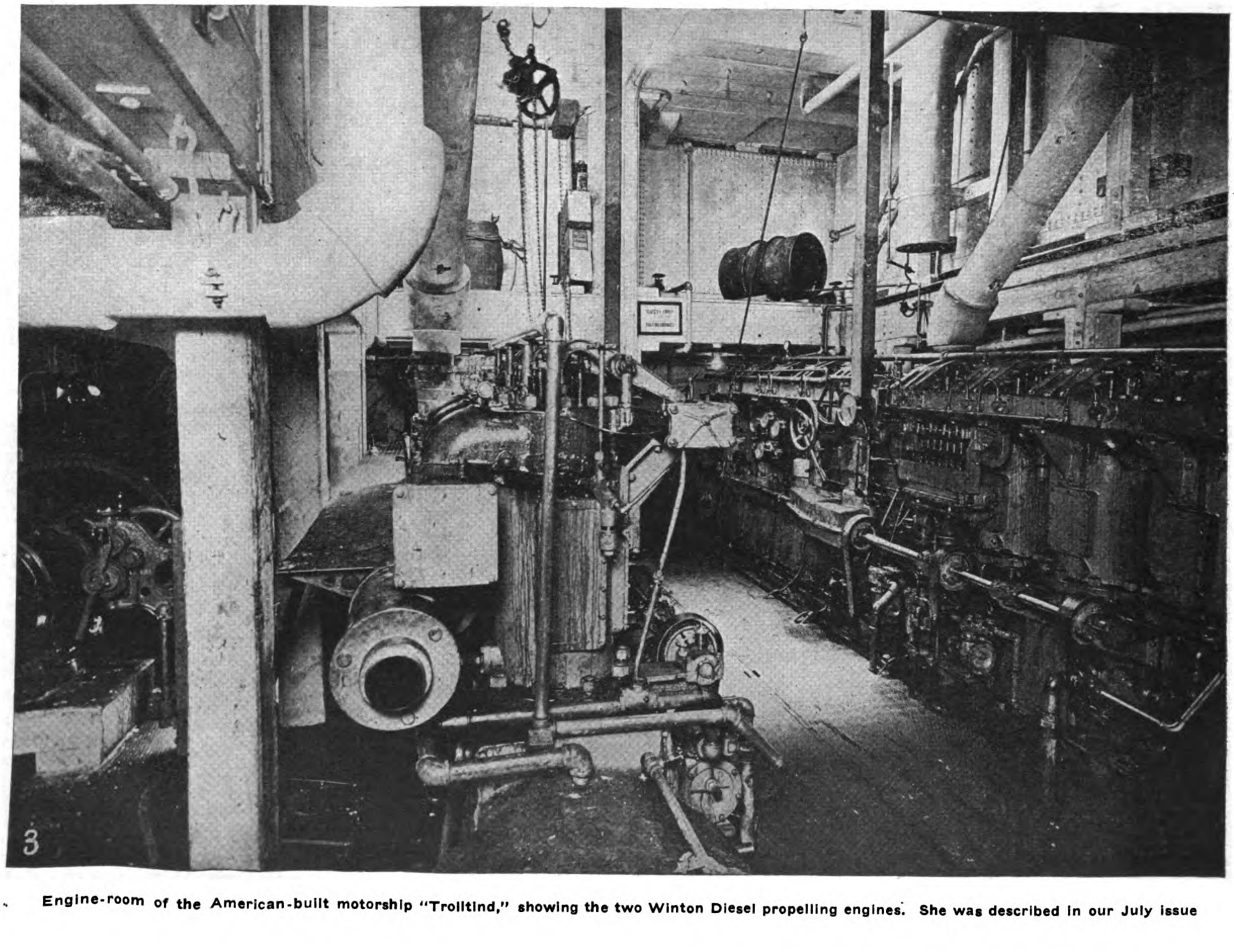
The "Nereus" or motor coaster of 400 gross tons has been launched at the yards of V. D. Windt, Vlaardingen.

Additional oil-engine manufacturers.

To the list of Diesel engine manufacturers of the world, which we published in the June issue should be added the name of the Pittsburgh Filter and Engineering Co. of Pittsburgh, Pa. This company has recently commenced building both the Hvid and full-Diesel type of marine and stationary oil-engines in sizes from 25 to 150 h.p. Still larger powers are being developed, but on the Diesel principle only. The factory is at Oil City, Pa.

Another firm unintentionally omitted from the July list was the Gulowsen Grei Engine Co. of Seattle, Wash. This company has entered very extensively the surface-ignition heavy oil engine field and are building a line of engines developing from 4 to 540 b.h.p. They are the two-cycle Grei type built under license from the A. Gulowsen A. S., Christiania, Norway.

It is sincerely hoped that the lists as corrected are complete and accurate. Although our facilities for obtaining and compiling such information are perhaps unexcelled, the reports may not be infallible and new incorporations are being established continually. We will appreciate additions and corrections from reliable sources.



Engine-room of the American-built motorship "Trolltind," showing the two Winton Diesel propelling engines. She was described in our July issue

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Super-Compressed-Air Applied to Solid-Injection Diesel Engines

An Interesting Theoretical Suggestion

By CHAS. G. BARRETT,

(Division of Operations, U. S. Shipping Board Emergency Fleet Corporation, Hampton Roads District)

THE term "super-compression" or "over-compression", as applied to internal combustion engines, refers to the compression of a small portion of the air within the cylinder walls to a pressure considerably in excess of the standard or prevailing compression pressure of the engine, as provided for in the combustion space. In the earlier days of internal-combustion engines, quite a number of patents were taken out covering arrangements for the production and utilization of super-compressed air, which arrangements may all be classified, either as to production or utilization, as follows:

Production

1. By means of an independent solid plunger-type piston working in a specially arranged cylinder space and acting upon air received from the main-cylinder at approximately compression pressure,—the piston itself being operated either by cam action or by compressed-air.
2. By direct action of the main-piston upon a portion of the air of compression, which is entrapped coincident with the forming of a super-compression chamber by the motion of the piston. This chamber exists only during the engagement of special formation on the piston and cylinder-head, while the piston is at or near the end of its out-stroke, and is not a permanent part of the cylinder structure.

Utilization

1. For purposes of ignition.
2. For purposes of injection.
3. For purposes of atomization.
4. For some combination of 1, 2, and 3.

From the above, it will be seen that the use of super-compressed-air primarily for the purpose of creating turbulence in the combustion space has apparently not been attempted. This is only natural, however, when considered in connection with the types of engine to which it has been applied. When used in connection with the semi-Diesel engine, for purposes of injection or ignition, the question of turbulence is of little or no importance on account of the instantaneous nature of the combustion. On the other hand, when used in connection with pure Diesel engines, super-compressed air has been employed for purposes of injection and atomization in an effort to replace the need of the usual air-compressor required for that service, so that such turbulence as resulted from its use was incidental and secondary to injection and atomization.

It has long been recognized that one of the most beneficial effects of the air-blast as used on air-injection Diesel engines is the creation and maintenance of that turbulent action in the combustion chamber whereby a thorough mixture of the injected fuel with the air of compression is secured. Throughout the period of injection, this high-pressure air-blast keeps the contents of the combustion chamber in a state of violent commotion, thereby bringing each minute fuel particle in intimate contact with its required air supply and effecting complete combustion of the whole charge.

Furthermore, on solid-injection Diesel engines, the relatively incomplete combustion indicated by the persistently smoky exhaust and lower thermal efficiency, has been ascribed largely to a lack of turbulence in the combustion chamber. Regardless of the highly satisfactory atomization which has been secured on this type of engine, it has not seemed possible to obtain the proper admixture of fuel and air necessary for complete combustion during the short time-period available. It would therefore seem that an arrangement for adapting super-compressed air to the creation of turbulence in the combustion space of solid-injection Diesel engines, is the the logical means of securing satisfactory combustion on these engines to equal that of air-injection engines. Certainly the efficiency of a high pressure air blast has been fully demonstrated on the air injection engine, and no other agent seems to lend itself to the accomplishment of the purpose in hand.

In attempting to devise an arrangement in accord with the above suggestion, it appears that maximum efficiency may be had by observing the following requirements relative to the production and utilization of the super-compressed air:—

1. Simplicity of parts and method of operation.
2. Minimum of interference with the established arrangement of combustion space, both as to piston and cylinder head.
3. Proper control of the time period of the air blast, in order that it may properly coincide with, or slightly over-lap, the period of fuel-injection.
4. Return of practically all the air used for super-compression during the combustion period, so as not to interfere materially with the volumetric efficiency of the cylinder.

The arrangement suggested by the accompanying drawing is designed to accomplish the desired result, with particular reference to two-cycle engines, where the possible absence of air and exhaust-valves from the cylinder head simplifies the adaptation. A somewhat similar design for four-cycle engines could, however, be devised. Although the function of the various parts is quite evident from the drawing, the following description of its operation may be useful:—

Description of Functioning

As the charge of air contained within the cylinder walls is compressed by the piston, a portion of it is forced through the holes or slots "J" into the super-compression space "G". These passages "J" must be of ample size to permit free access of the air and thereby prevent any tendency of the compressor-ring to be prematurely raised from its position on account of an unbalanced air pressure on its lower side. For the same reason, the compressor ring is turned oversize above the inner spring ring "C".

As the piston nears the end of its stroke, the main body of air in the combustion space as well as the portion of it now contained in the space "G" being almost at compression-pressure, the displacement ring "A" comes in contact with the compressor ring "B" and moves it up through a distance equal to the remainder of the piston stroke. This closes the ports "J" and at the same time further compresses the air in the space "G" to a predetermined super-compression pressure sufficient to open the valves "D"—say 1,000 to 1,200 lbs.

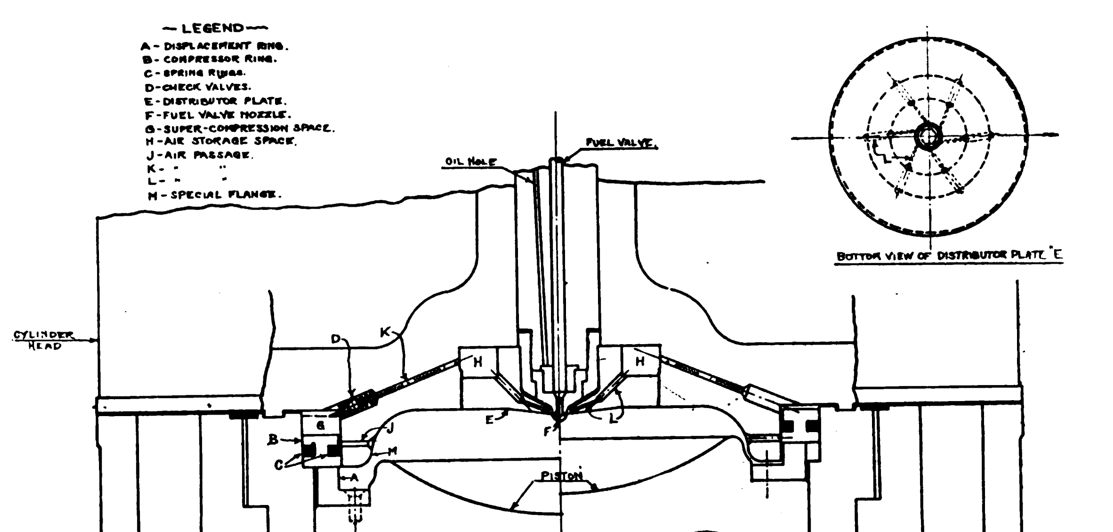
Therefore as the stroke of the ring "B" is completed, this super-compressed air is forced through into the reservoir "H", whence it is properly directed, through the passages "L", tangentially about the fuel nozzle "F" and directly in line with the spray orifices, thereby assisting atomization and producing a whirling turbulence. By properly adjusting the size and number of the small holes "L", the period required for the reservoir "H" to exhaust its excess pressure may be timed to properly coincide with the period of fuel-injection, thereby producing a high-pressure blast during this interval.

However, throughout the expansion stroke, as the pressure within the cylinder falls there will be a further expansion of the air from "H" through the holes "L", tending to keep the fuel-nozzle clean and free from carbon deposits. As the piston starts on the expansion stroke, it is followed by the ring "B", which will be driven back to its seat against the shoulder in the liner by the high pressure air retained in the clearance space.

Should it be necessary, a positive return of the ring to its lower position can be insured by the insertion of compression springs between the ring and the cylinder head. When the piston reaches the end of the expansion stroke, the pressures in "G" and "H" have become equalized with the exhaust pressure of the cylinder, and all is ready for repeating the whole process during the next cycle.

Reference to the drawing in connection with the four requirements above noted as necessary for maximum efficiency will show that these requirements have been approximated, as follows:—

1. Simplicity has been sought in so far as it is obtainable without sacrificing efficiency. The solid-piston, operated by air or cams has been discarded on account of its complications. At the same time, the type of ring-piston compressor adopted is so much more efficient and positive in its action than the somewhat simpler device described in the first paragraph as the second "Production" classification, that it is considered preferable.
2. By using an annular compression space approximating the cylinder diameter, the necessary super-compression volume is secured with a minimum cross-sectional area. Both by location and dimension, therefore, there is a minimum of interference with the stand-



Arrangement of Diesel Engine Cylinder for Super-Compression of Air

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ard design of cylinder-head, piston, and combustion chamber.

3. The period required for the storage space "H" to exhaust its excess pressure may be controlled to its required relation to the injection period by properly adjusting the size and number of the small holes "L". Or more accurate and positive control of the delivery may of course be had by leading the air from "H" through a positively controlled needle-valve before allowing it to expand back into the cylinder. In either case, however, an accumulator space "H", with non-return valves "D", is essential.

4. After the expansion of the super-compressed air back into the cylinder has been completed, the storage space "H" still retains a charge of air at about compression pressure, which, with the small amount left in the clearance space of the compressor chamber, is ineffective in producing combustion and therefore tends to lower the volumetric efficiency. However, basing the air requirements on what has been found necessary for air-injection engines, the volume of the compressor space "G" need be only about one-fiftieth of cylinder compression volume, and the volume of "H" being about one-third of "G", it is evident that the inert air retained in "H" after expansion will be substantially less than 1% of the cylinder volume, so that its deterrent effect may be considered negligible.

From the above discussion, it therefore appears that some practical and worth-while results may very possibly be derived by again resorting to an expedient which has been tried and found wanting on other types of engines. The trouble with super-compression, as previously applied, was not that it had any inherently bad features, but rather that better and more efficient means were found to achieve the results sought for. As there seems to be no other possible way to obtain turbulence in the combustion chamber of solid-injection engines, super-compressed air may at last here find its usefulness.

The writer recognizes the more or less theoretical nature of the above discussion, and regrets his inability to substantiate his ideas. Some considerable experimentation will undoubtedly be required to demonstrate the usefulness, or otherwise, of the suggestions submitted, but if these suggestions should chance to direct investigations toward some ultimate improvement in the operating efficiency of the solid-injection engine, no further apology will be required for their publication.

GRAPHICAL REPRESENTATION OF THE STEAMSHIP VS THE MOTORSHIP

In 1917 there was published in "Shipbuilding and Shipping Record" (England) a chart showing the relation of displacement, dead weight capacity, power, dimensions and speed of the average type of cargo vessels. This chart is published herewith; but added thereon are curves showing the relative displacements and machinery weights for the same variations in dead weight capacity when the ships are equipped with Diesel engines.

The dot and dash line A B was also added; for by reading the vertical distances between it and the total displacement curves at any value of d.w.c. the weight of machinery plus the hull may be found (total displacement = wt. of hull + wt. of machinery + dead weight capacity). Aside from its original use which should have been extensive for approximate calculations, the amended chart will be of especial interest to readers of "Motorship."

Comparing a large motorship (say of 10,000 tons d.w.c.) with a steamship of the same dead weight capacity, we find the displacement of the motorship to be 1250 tons less than that of the steamship. The motorship's displacement in this case is only 13,000 tons. By projecting horizontally to the left onto the steamship displacement line we can then drop a vertical line intercepting all the curves, which will give the breadth, length draft and required horse power of a hull which, when equipped with Diesel engines, will provide the original 10,000 tons d.w.c.

Tabulating the results obtained from these curves, we can show conclusively the superiority of the motorship when all around economy is sought.

	Steamship	Motorship
Dead weight capacity	10,000 tons	10,000 tons
Displacement	14,250 tons	13,000 tons
Hull & Machinery Weights	4,250 tons	3,000 tons
Machinery Weights	560 tons	310 tons
I.H.P.	2,800 tons	2,500 tons
Length	445 ft.	425 ft.
Breadth	54 ft.	52.5 ft
Draft	27 ft.	26.5 ft

It is seen that the characteristics of the motorship of 10,000 tons d.w.c. are the same as for a steamship of 9,150 tons d.w.c. Another point to be noticed is that the differences between the third and fourth items are the bare hull weights. Thus the economy achieved in the motorship of structural material is 1,000 tons.

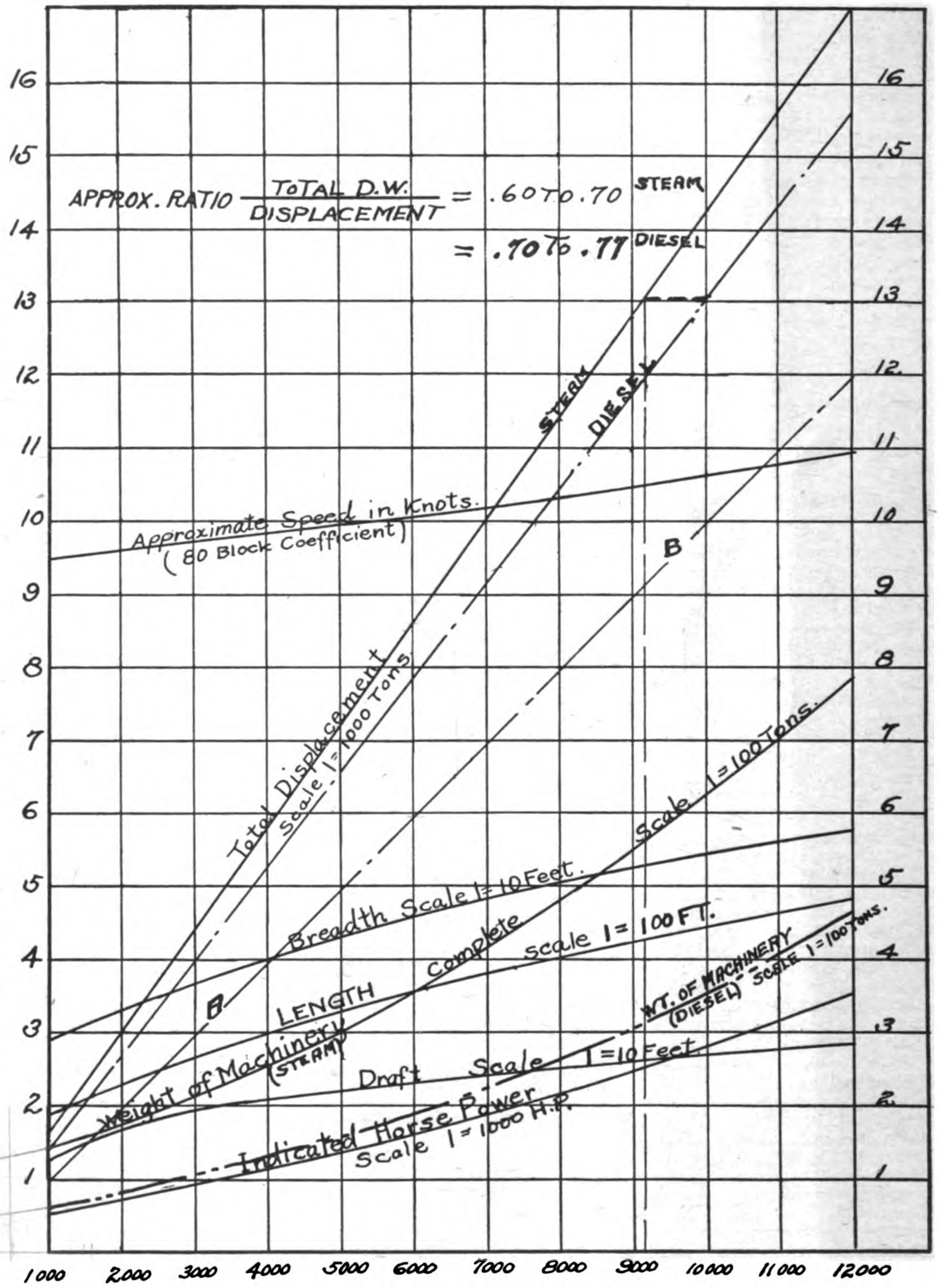
Unfortunately the above comparisons are on the basis of dead weight capacity. This is not fair to the motorship, for this term as applied to both types of ships includes ships stores, fuel, fresh water, crew and their effects and actual cargo carrying capacity. The fuel consumption of a motorship of 1,000 b.h.p. will be at least eleven tons per day less than that of a coal burning steamship of the same power. The item of fresh water will also be considerably decreased in the motorship from that required in the steamship. Returning to further comparison of the two ships in the above table we see that the motorship would consume at least 27 tons less fuel per day than the steamship. Adding the decrease in fresh water carried to the fuel saving on a 20-day voyage, we see that there will be over 500 tons additional cargo carrying capacity between the two ships. This is in spite of the fact that our 10,000 d.w.c. motorship is a smaller vessel than the 10,000 d.w.c. steamship.

In using the chart it should be borne in mind that the original curves are all based on full lined cargo steamships of 0.80 block coefficient. To find the dead weight capacity of a motorship of a certain length, etc., do not fail to project up to the steamship displacement line and then horizontally to the right onto the motorship displacement line. This last intersection projected to the line A B or to the base will show the resulting d.w.c. of the motorship.

Following is the table showing the relation between the chart values of d.w.c. on a given length with that obtained in actual motorships.

Name	Length	D.W.C. Ship	D.W.C. Chart
"Suecia"	362	6,600	6,800
"Siam"	410	9,700	9,200
"Fordonian"	250	3,300	2,900
"Eavestone"	275	3,050	3,500
"Christian X"	386	7,400	7,700
"Falstria"	365	6,700	6,850
"Santa Margherita"	440	11,000	11,000
"Bullaren"	425	9,500	9,800

Remarks: The average cargo motorship has a less block coefficient than .80 upon which the chart was based. Hence the chart values will generally exceed actual practice.



Courtesy of "Shipbuilding & Shipping Record"

— APPROXIMATE DIMENSIONS ETC. CARGO VESSELS —

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Our Readers' Opinions

(The publication of letters does not necessarily imply Editorial Endorsement of opinions expressed.)

REMARKS BY A CHIEF ENGINEER

To the Editor of "Motorship,"
Sir:—

Mishaps and shutdowns are few and far between on a full powered motorship. I have just completed a trip to Lisbon, Portugal, and return—making it in forty-five days at sea, a total distance of six thousand miles. Being twin screw, we made a remarkable trip in very bad weather with only one man on watch in the engine-room.

Going over, the starboard engine did not stop, and only one stop was made on the port engine and that was not necessary. Coming home, one stop was made on the port engine on account of clutch trouble, and two stops were made on the starboard engine, one of which was not necessary.

A little trouble was experienced with the air compressor valves, but they are readily repaired or replaced without shutting the main engines down, for they will run on one compressor, as each engine has two two-stage compressors.

All the work required while at sea of the man on watch is to oil the exhaust valve stems every fifteen minutes, and other working parts once an hour. He also has to keep a good look-out on the gravity lubricating-oil tanks, for they furnish oil for the main-bearings, conecting-rod bearings and wrist-pins.

The service from and the economy in operating the main engines has been wonderful. It ought to be an answer to those who have a question in their mind as to the value of a Diesel powered ship.

Very truly yours,
Wm. J. Andrews,

Chief Engineer,
Motorship "Edith Nute,"
Pier 1, Erie Basin,
Brooklyn, N. Y.

CLEANLINESS IN THE ENGINE ROOM

To the Editor of "Motorship,"
Sir:

There are certain things a good engineer considers part of the "rules of conduct" concerning his duties. One of them is:—be neat and clean personally and about the engine room. The writer knows full well the popular conception of a man standing watch. It is to imagine him soaked in oil, in a dirty undershirt or none at all—clattering about in his engine-room shoes, because of the lack of laces; or if there are laces they are most likely whipping around his feet as he walks. Many are the thoughts called to mind when one reminisces on "engineers he has known." Usually with this type of engineer, the pumps are leaky at the glands, there is a hissing from steam leaks at joints in inconvenient places—the floor plates are reeking with oil—everything one touches is wet with dirty oil and bright work is conspicuous by its absence.

Fortunately, though quite naturally, this kind of engineer is not found on the bigger and better boats. There is a reason and it has a close connection to my subject. When a man is unnecessarily dirty, he is careless and possesses little personal pride. If he has no pride, he takes no pride in his surroundings, his work and hence his machinery suffers.

Going to sea with steam or Diesel engines is often unpleasant for short periods. Troubles may crop up that require hot, dirty and continuous work. We all get our share of those experiences and thay can not always be avoided. However, when you find a neat, clean engineer's stateroom you will find out the following about his work. His bright work is polished, the dynamo engine runs when required, and his pumps don't leak or slam. You don't need a handful of waste to take hold of the railings and hot water won't drip on you from above. He will be neat and exact in scraping and fitting his bearings—his allowance of lubricating oil will generally last the whole watch and last but most pleasant to see— the storeroom will be arranged so that the hundred and one things one can want in a hurry will be where he last put them, in the right place.

I recently went below while crossing to New York on a ferryboat. There I saw great spreading sheets of newspaper on the floor plates—evidently they had gotten too slippery for even the crew on watch. The reversing engine was continuously sputtering steam and hot water. There were three eccentric straps being fed a continuous stream of water. Two of the four big-end bearings of the connecting-rods had developed a knock and the remains of a partially consumed lunch had been left on the engineer's desk. I looked at the chief and his oiler and understood. They were not the men I had expected to see and the appearance of the engine room told me my friends had not been there for some time.

Sincerely yours,
A Reader

NOTES ON THE OPERATION OF AN OIL ENGINE

Sir:

The writer has been affiliated with a twin 320 b.h.p. installation of the surface ignition type for a year, and takes this opportunity of passing on what little knowledge he as acquired.

The water-service to the caps of the main bearings is rather misleading, as the shaft does not touch the caps. A better "wrinkle" would be a pipe extending the full length of the engine frame with branches to the under side of all main bearings and also to the bottom half of the thrust housing. These branches could be controlled by individual valves which are normally left closed. Dispensing with the cooling of the top halves also does away with ten unions and the attendant possibility of salt water leaking directly upon frictional surfaces.

Lubrication of the main bearings is a rather ticklish matter at times, and it is largely governed by the oil grooving of the white metal. This is so important that when taking over a ship it would really pay the engineer to roll out one of the bottom halves for inspection. Longitudinal oil grooves (1/8" x 1/8") milled into the bearing surfaces of the shaft and extending within one-half inch of either end are also a great help. Another aid very easy to install is an oil box with pipe connections so that a bearing which shows signs of heating may be flooded with oil.

The gravity cups which feed the eccentric straps are rather inaccessible and extremely difficult of observation. Installing them upon an angle line bolted to the front of the operating cylinder brings them plainly into view. This is obviously an advantage.

It is advisable to have a connection and valve in the cooling system just past the circulating pump. This valve will connect with the sea through an auxiliary pump. The circulation of water while the torches are lit (preparatory to starting) will eliminate the possibility of cracked cylinder heads. This system would also prevent the necessity of shutting down in the event of any damage to the circulating pumps and is also handy to cool off the engines after stopping.

Pet-cocks in the fuel lines located close to the injectors serve the purpose of ridding the line of air pockets without the necessity of breaking any connections. If the fuel line be teed at its lowest level and a trap let downward from there a surprising amount of water can be separated from the fuel. Also a flexible connection in the day tank held up by a float will prove of great advantage should the tank ever be inadvertently pumped full of water, or poor fuel.

The rubber diaphragms in the fuel line are advantageous but accasionally rot through around the edges and are carried with the flow of oil until they blank off the pump suction. This can be prevented by cutting discs of gauze of a corresponding size to the diaghragm and placing them inside the same. These gauze screens may be secured in place in the same way as the rubber diaphragms.

If valves are placed in the air lines close to the injectors they will be a great help in maintaining an even temperature in all cylinders. The lever controlling the butterfly valves in the scavenging air by-pass should never be entirely closed for the reason that a small amount of air will greatly diminish carbon deposits.

If possible it is advantageous to have two day tanks so that each tank can be filled and entirely purged of foreign matter before it is used again. Care should be taken that the pressure due to the height of the tank is not sufficient to force the oil by gravity into the cylinders when the engines are not operating. The thrust-bearings are a matter of great interest to the writer and he would highly appreciate any suggestion which might add to their longevity.

I trust these notes will be of use to other ship's engineers.

Yours very truly,
CHIEF ENGINEER.

TWO NEW 3,000-TON MOTORSHIPS

The Anderson Shipbuilding Corporation, of Seattle, have two 3,000-ton d.w.c. motorships on the stocks for Messrs. Chris. Hannevig, Inc.

To the Editor of "Motorship,"
Dear Sir:

The writer acknowledges with thanks the "War and Peace Commemorative Supplement" which you sent him with your June issue of "Motorship."

The achievements of Messrs. Schneider & Cie, the great French engineers, as evidenced in this supplement, comprise one of the most interesting records of war industry. The supplement has been reviewed with intense interest.

Yours very truly,
F. W. ROGERS,
Comptroller's Department.

Vacuum Oil Company,
61 Broadway, New York.

AN INTERESTING DECISION ON EMBARGO SHIPMENTS

A shipper recently failed to make delivery on an order for export flour. This commodity was under embargo and a controversy arose as to which party was obligated to obtain the permit to move the shipment. In the suit growing out of the failure of the shipper to make delivery, it was decided that the obligation rested with the purchaser. It developed that the shipper, who was the defendant in the action, had informed the purchaser previous to accepting the order, that all contracts would be subject to embargo. In the opinion of the court this relieved the shipper from the obligation to obtain the permit to ship. The failure of the purchaser to obtain such permit relieved the shipper from any obligation to fill the contract while the embargo remained in force. This action was decided in the United States District Court for the Southern District in favor of the defendant who was represented by Harrington, Bingham and Engler, Counsellors at Law, 64 Wall Street, New York City.

HIGH POWERED UNIT TO HAVE PRACTICAL TEST

3,000 H.P. in four cylinders will be the output of the new solid-injection two-cycle opposed-piston engine developed by Messrs. William Doxford & Sons, Sunderland, England. This will be the highest powered engine per cylinder of any yet constructed and the first unit will be installed in a single screw cargo vessel.

To the Editor of "Motorship,"
Sir:

We have just received a copy of "Motorship," together with a copy of the special edition mentioned in your letter of June 28th. Both copies are fine specimens of printing art and are in every way worthy of most favorable comment.

Yours very truly,
O. L. DEMING,
Advertising Dept.

American Can Company,
120 Broadway,
New York, N. Y.

To the Editor of "Motorship,"
Sir:

Hearty thanks for art-supplement, which you were good enough to tender us recently. It is all that you have said—unique and interesting.

Appreciating your courtesy in the matter of favoring us with a copy of this work, we are,

Yours very truly,
JNO. J. CONE.

Robert W. Hunt & Co.,
West Street Bldg.,
New York, N. Y.

To the Editor of "Motorship,"
Sir:

The Engineering Societies Library desires to acknowledge the receipt of your gift of the War and Peace Commemorative Supplement to the June issue of "Motorship," and to express its appreciation of your courtesy.

Yours very truly,
HARRISON W. CRAVER,
Director.

Engineering Societies Library,
29 West 39th St.,
New York, Y. Y.

TUXHAM ENGINED DANISH SCHOONER

The new Danish schooner "Dronning Dagmar", a vessel of 625 tons d.w.c. has bee. installed with a 150 h.p. Tuxham oil engine. He. owners are the A. S. Kofoeds Skibsbygeri ved Fa... e, and she was built by the Danvenike Co.

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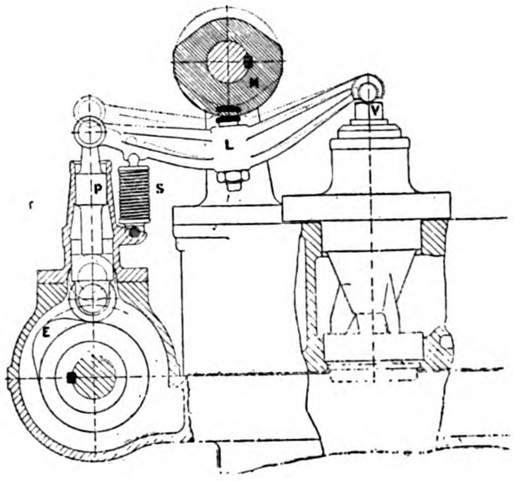
A British 400 H. P. Highspeed Diesel Engine

Design Details and Trial Results

THIS engine is fundamentally a development of the motor formerly constructed by Messrs. Armstrong, Whitworth & Co. Ltd. to the designs of a two-cycle submarine engine supplied Messrs. Schneider et Cie. of Creusot. Many important changes have been made in the frame construction and valve gear. The new design is of a six-cylinder four-stroke cycle direct-reversible engine with cylinders of ⅝″ bore by 13½″ stroke developing 400 b.h.p. at 400 R.P.M. A special Reavell air-compressor is driven off the forward end of the crank-shaft.

All strength members of the framing are cast steel. These include the cylinder-heads, cylinder-jackets, upper-crank-case, and bed-plate. The cylinder-liners are of a special cast iron. The crank-shaft is in two pieces with a coupling between the two centre cylinders, Nos. 3 and 4. On this coupling is mounted a helical gear, which meshes with the vertical cam-shaft drive. At the upper level of the crank-case this vertical shaft is fitted with a bevel gear which operates the fuel pump and the air starting distributor valves. The position of these can be seen below the cam gear casings—at the centre of the engine. The cam shaft is also driven by bevel gears running in an oil bath at the top of the vertical shaft, provision being made for the camshaft to slide axially in its bevel gear when maneuvering.

The drawing of the end elevation of the valve gear indicates the principle on which the gear operates. The gear is shown in the ahead position, the exhaust cam (E) raising the push rod (P) and depressing the valve (V) by means of the lever (L), which bears against the cam (M) on the maneuvering shaft. Similar cams are provided for the lever fulcrum pieces of the fuel and induction valves. In order to prevent the push-rod rollers fouling the valve cams when sliding the camshaft, it is necessary to raise the push-rods clear of the maximum cam lift. This is



Arrangement of maneuvering shaft and valve gear

done by turning the maneuvering shaft until it reaches the dotted position; the springs (S) press the valve levers against the maneuvering cams, thus lifting the push-rod and rollers. Suitable design of the maneuvering shaft cams enables the corresponding valves either to operate or be cut out of action as required during the maneuvering period. The raised position on the exhaust valve maneuvering cams gives a period of decompression during maneuvering which eliminates the danger of recompressing a partly-expanded charge when all valves are inoperative in the out-of-gear position of the rollers.

The maneuvering shaft is turned by bevel wheels on the end vertical shaft operated by a worm and wheel from the large hand wheel at the forward end of the engine. The smaller wheel below is for fuel control.

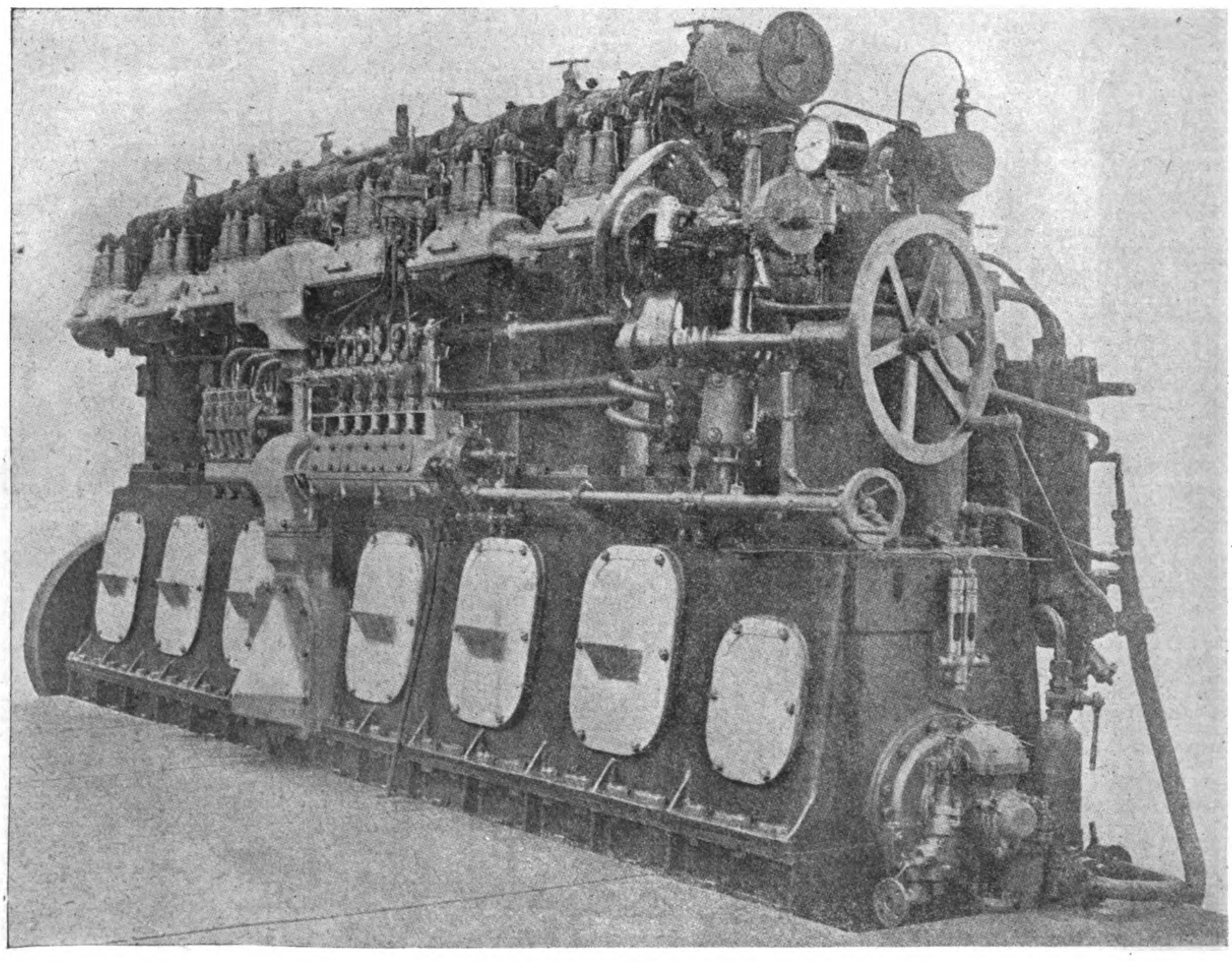
An indicator at the end of the maneuvering shaft shows the position of the gear and whether the engine is set for ahead or astern running.

The neutral or mid-setting is arranged so that all rollers are raised from the camshaft, which is then half-way between the ahead and astern positions; at the same time the air starting valves are closed, and the fuel pump suction valves tripped, thus preventing any delivery of fuel.

Five turns of the handwheel in one direction brings the gear into the full-ahead position, and five in the opposite direction to full-astern position.

The first turn revolves the vertical and manœuvring shafts through one-tenth of a revolution and slides the camshaft, bringing, say, the ahead cams under the rollers. The next turn locks the camshaft and turns the maneuvering shaft until the exhaust valves are decompressed and the induction valves in action. The third turn opens the air-starting valves to all cylinders. The fourth revolution cuts the air off three cylinders, engages the fuel valves and also releases the corresponding fuel pump suction valves, allowing these three pumps to deliver fuel. The final turn of the handwheel cuts out the air starting system, and brings the remaining three cylinders on to fuel. On reversing trials it has been found that complete reversing from full ahead to full astern can be effected in 12 seconds.

The engine pistons are of the trunk type and in halves. Contrary to usual practice the pins are locked in the connecting rods and the bushes are held in the lower part of the pistons. This arrangement gives perfect satisfaction, and has the advantage of securing a much larger bearing surface than is possible with the bushes in the connecting rod.



400 B.H.P. Armstrong-Witworth High Speed Diesel Engine as Fitted in British Submarines

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The gudgeon-pin bushes are lubricated from the main lubrication system through a hole drilled up the centre of the connecting rod.

Lubricating oil is supplied under pressure from a reciprocating pump, located at the forward end of the engine. This pump and a fuel service pump are driven from a cross shaft geared to the crankshaft by a worm drive, and they may be disconnected from the engine quite easily for hand priming before starting up.

The compressor air coolers are of the straight tube type, and can be seen outboard at the forward end of the engine.

It was found on running the first completed engine of the type that nothing but very trivial modifications were necessary, and after only a few hours tuning up the engine was given its official trial. This was a 72-hour non-stop run at 380 b.h.p. and was successfully carried out without any trouble whatever.

The attention required during running is very small, as every important part is enclosed and fitted with either oilbath or forced lubrication. The exhaust valve cages are water-cooled, this ensuring free operation and absence of "gumming" of the spindles and guides.

The following are the results of the 72 hours' official trial:—

Mean b.h.p., 378.
Mean i.h.p., 485.
Mechanical efficiency, 77.9 per cent.
Fuel per b.h.p. hour .45 lb.
Calorific value (lower), 18,200 B.T.U.s per lb.
L.P. air cooler pressure, 65 lb. per sq. in.
I.P. air cooler pressure, 290 lb. per sq. in.
H.P. air cooler pressure, 955 lb. per sq. in.

The engine runs well on either Light Shale oil or Texas Crude, and no special adjustment is necessary to suit the different fuels.

Motorships on the Great Lakes

Past Performances in the Light of Modern Practice

By GEORGE NICHOLSON

At present when the motorship is advocated for service in the Great Lakes trade, those who have their prejudices are apt to dismiss the proposition as one already proven a failure. Analysis of the actual conditions will reveal the true causes of the troubles experienced with those early installations. The story has its counterpart in the experiences with the first steam boilers, steam engines, turbines, electric drive, etc.

As the knowledge gained from experience has been employed to develop these other branches of marine engineering, so has progress been made in the application of the Diesel engine to marine propulsion. In fact the strides made in adopting this type of propelling machinery to marine uses is without a parallel in the history of marine engineering. In the few years which have elapsed since the first ocean-going cargo ship was equipped with Diesel engines, we have solved all the problems which gave the trouble in the early installations. These modern motorships have maintained their reliability and economical efficiency over long periods of actual service. In the light of present knowledge, the facts concerning each motorship placed in the Great Lakes service furnish a complete explanation of any deficiencies attributed to them. The motorship will re-enter the Great Lakes commerce and when it does it will prove its claim as the logical successor of the steam driven freighter.

The early motorships in the order in which they were placed in service, were the "Toiler," "Calgary," "Fordonian," and the "Tynemount." All excepting the latter were powered with two-cycle engines. "Tynemount" had a pair of high speed stationary type Diesel engines direct-connected to electric generators. Trouble was experienced with the electric transmission, which system also was in its infancy at that time.

The first of these ships, the "Toiler," was greatly under-powered, a frequent mistake in the early days. She was built by Swan, Hunter and Wigham Richardson of Wallsend-on-Tyne, England, and was the first motorship to cross the Atlantic. Her dimensions were; length 248 feet, breadth 42′ 6″, draft 14′ 0″ and dead weight capacity 2460 tons. The motors were twin 180 b.h.p. Polar-Diesel engines which gave good service, though much too small in power for the size of vessel. Her speed was only seven knots in smooth water. Unable to make headway against the swift current of the St. Lawrence River, which she had to navigate in her service between Montreal and the Lakes, her motors were taken out and steam engines of greater power installed. The failure of this pioneer motorship is to be attributed directly to the fault of the designer in underpowering the ship. The engines were hopelessly overloaded and quite unsuited for the work required of them.

The "Calgary" was the next motorship on the Lakes and appeared in the latter part of 1912. She was built by the same firm as the "Toiler" but was equipped with a little more power. The main engines were 4-cylinder 2-cycle Polar-Diesels developing 260 h.p. each with two scavaging cylinders driven off the crank shaft. The engines were similar to those of the "Toiler" but still much too small for the work they had to do. A two-cycle engine will seldom stand up under a continuous overload, and after a period of uncertain operation the vessel was sold and is now in service on the Atlantic Coast.

About the same time the motorship "Fordonian" was also placed in service, and proved to be more successful than any of her predecessors. She is a steel vessel 250′ 0″ between perpendiculars, 42′ 8″ beam and 16′ 10″ moulded depth. Her designed draught was 16′ 6″ but this was decreased to 14′ 0″ on account of the depth of the canals she had to navigate. Her dead weight capacity on the reduced draught is 2,200 tons. She was built by the Clyde Shipbuilding and Engineering Co. of Port Glasgow, for the Canadian Interlake Line, Ltd. of Montreal, Canada. The main engine is a four-cylinder two-cycle Carel-Diesel developing 750 b.h.p. at 100 r.p.m. The cylinders are 18″ bore by 32¼″ stroke with four scavaging valves in the head and exhaust ports uncovered by the piston at the bottom of the stroke. Her speed is 10 knots loaded. An oil-fired donkey boiler located on the upper deck in a house aft of the engine hatch, supplies steam for all auxiliary and deck machinery.

Early in 1913 the M. S. "Tynemount" began her service, operated by the Montreal Transportation Co. Ltd. Montreal, Canada. She was built in England by Swan, Hunter & Wigham Richardson and was 256 ft. long, 42 ft. beam, and 19 ft. molded depth. Her dead weight capacity was 2400 tons on a draught of 14 ft. in fresh water. The main engines were two Mirrless, Bickerton and Day, 6-cylinder, 4-cycle Diesels of 12″ diam. and 13½″ stroke. They were directly connected to alternating-current generators delivering 235 amperes at 500 volts to a single 500 h.p. motor turning at 78 r.p.m. An oil-fired boiler supplied steam to the auxiliaries. The main engines and generators proved to be unsuited to the conditions of service, being designed primarily as electric lighting sets. Eventually steam power replaced this outfit and this added to the prejudice and misunderstanding concerning the motorship.

However, the errors which produced the unhappy events enumerated above were purely those of application and do not indicate a faulty principle. Modern motorships when placed in service on the Great Lakes will demonstrate the reliability and economy of the type just as they have in competition with the steamship elsewhere.

CONVERSION OF THE "CALCUTTA" TO TRAINING MOTORSHIP

The barque "Calcutta" owned by the Anglo-Saxon Petroleum Co. of London, is being overhauled, repaired and fitted with a pair of surface-ignition heavy-oil engines of the two-cycle type. She will be used as a training ship for officers, sailors and engineers.

ACTIVITY IN EUROPEAN SHIPYARDS AND DIESEL ENGINE SHOPS

Sometime ago we published a list of ships built in Norway and engined by the Werkspoor Engineering Works, Amsterdam, Holland. This list has been revised and corrected to date and gives a total of ten large steel motorships with a total displacement of 66,300 tons and a maximum indicated horsepower of 22,480 from 15 engines of six cylinders each. A table of particulars of the Werkspoor engines of 475 i.h.p. to 2,500 i.h.p. in units of four to six cylinders each, is also published herewith.

Norwegian Motorships with Werkspoor Diesel Engines

Name of Ship	Owner	Builder	Displacement Tons	Engines	Total Power
"Salerno"	Dampskibaktieselskabet Otto Thoresen's Linie, Kristiania, Norway.	J. K. Smit's Scheepswerf Kinderdijk	9700	Twin 6 cyl.	2800 IHP
"Athene"	Dampskibaktieselskabet Ada, ved. K. Salvesen, Kragerö, Norway.	Werf. Vh. Rijkee & Co. Rotterdam.	9700	Twin 6 cyl.	2800 IHP
"San Miguel"	Dampskibsaktieselskabet, Otto Thorsesen's Linie Kristiania, Norway.	J. K. Smit's Scheepswerf Kinderdijk.	4050	Single 6 cyl.	1400 IHP
"San Paulo"	Dampskibsaktieselskabet Otto Thoresen's Linie, Kristiania, Norway.	Werf. Vh. Rijkee & Co., Rotterdam.	9700	Twin 6 cyl.	2800 IHP
"Sardinia"	Dampskibsaktieselskabet Otto Thorsen's Linie, Kristiania, Norway.	J. K. Smit's Scheepswerf Kinderdijk.	4050	Single 6 cyl.	2140 IHP
"San Andres"	Dampskibsaktieselskabet Otto Thorsen's Linie, Kristiania, Norway.	J. K. Smit's Scheepswerf Kinderdijk.	....	Single 6 cyl.	2140 IHP
"Geisha"	Winge & Co., Kristiania, Norway.	Nederlandsche Scheepsbouw Maatschappy, Amsterdam.	9700	Twin 6 cyl.	2800 IHP
"Geisha II"	Winge & Co., Kristiania, Norway.		9700	Twin 6 cyl.	2800 IHP
"Tosca"	Winge & Co., Kristiania, Norway	Nederlandsche Scheepsbouw Maatschappy, Amsterdam.	9700	Twin 6 cyl.	2800 IHP

WERKSPOOR MARINE DIESEL ENGINES

	Non. Revers	Revers	Non Revers	Revers	Revers	Revers	Revers	Revers	Revers
No. of Cylinder	4	6	4	6	6	6	6	6	6
I.H.P. Max.	475	700	600	910	1150	1400	1760	2140	2500
B.H.P. Max.	340	500	440	660	825	1020	1270	1540	1800
I. H. P. Norm.	425	640	550	830	1050	1280	1600	1940	2270
B. H. P. Norm.	305	460	400	600	750	920	1150	1400	1640
Bore Inches	15.748	15.748	18.1103	18.1103	20.4725	22.0473	24.4095	26.3780	28.7402
Stroke Inches	27.559	27.559	31.496	31.496	35.4331	39.3702	43.3172	47.2441	51.1812
Length without flywheel in m. m.	....	6240	......	......	8000	8950	....	10350	....
Length without flywheel in Ft.	....	20′5¾″	......	......	26′ 3″	29′ 4¼″	....	33′ 11½″	....
Length with flywheel and Thrusts m. m.	7800	8510	......	......	11000	12200	....	13850	....
Length with flywheel and Thrusts m. m.	25′ 7⅛″	27′ 11⅛″	......	......	36′ 1″	40′ 0″	....	45′ 5¼″	....
Width included compress. m. m.	2650	3330	......	......	2850	3225	....	4000	....
Width included compress in Ft.	8′ 8⅜″	′10′ 11⅛″	......	......	9′ 4¼″	10′ 7″	....	13′ 1½″	....
Height above crank shaft to c.l. Exh. pipe m. m.	5200	5000	......	......	6100	6500	....	7700	....
Height above crank shaft to c.l. Exh. pipe in feet	17′ 0¾″	16′ 5″	......	......	20′ 0¼″	21′ 4″	....	25′ 3¼″	....
Weight Compl. with fly wheel in tons App.	45	66	......	......	95	120	....	180	210
Mean indicated press Norm. lbs. per sq. in.	88.875	88.875	88.875	88.875	88.875	88.875	88.875	88.875	88.875
Mech. Effic. in %	72	72	72	72	72	72	72	72	72
Guar. Fuel Cons. per IHP in Grammes	150	150	150	150	150	150	150	150	150
Guar. Fuel Cons. per IHP in lbs.	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Diam. of Crankshaft in m. m.	250	250	......	......	320	350	....	415	....
Diam. of Crankshaft in inches	9⅞″	9⅞″	......	......	12⅝″	13¾″	....	16⅜″	....

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Remarks on the "Glenapp's" Machinery

Results of Seven Years' Experience in the Burmeister and Wain Engines

COMPARISON of the installation of the B. & W. engines in the M.S. "Selandia" at Copenhagen, in 1912, and those recently constructed under license by Harland & Wolff, Ltd., might be expected to show numerous changes in design and details. It is found, however, that such is not the case. The important alterations made in seven years amount to but three and have to do with the piston cooling, the fuel pumps and the main air compressor. Our British contemporary, "Engineering," discusses these changes at length. It might have been thought necessary to give, says our contemporary, many details of improvements which had been made since the days of the "Selandia," the engines of which are of the same type, but built by Messrs. Burmeister and Wain, of Copenhagen, whilst those of the "Glenapp" were built by Harland and Wolff, Ltd., under license from the Danish company. But we found, in fact, nothing of the kind, and it is a remarkable testimony both to the genius of Messrs. Burmeister and Wain and the foresight of Messrs. Harland and Wolff.

Dealing with these three alterations, we recall that, in the "Selandia," the lubricating oil, after passing up the connecting-rod, entered the piston through the hollow piston-rod in order to cool the piston, and then flowed back through the rod to lubricate the gudgeon pin and guides. Experience has shown that the heat of the piston in these engines at all events is sufficient to carbonize quite an appreciable amount of the oil, thus not only causing waste, but forming a deposit on the internal piston surfaces, which interferes with cooling—a rather vital objection, though we believe that in many fast-running two-cycle engines of fairly large power oil cooling is still used with perfect satisfaction. However that may be, the oil circulation has been modified in the "Glenapp," and water is used to cool the pistons.

The alteration in connection with the fuel pumps consists in the substitution of a battery of eight fuel pumps for the eight cylinders in each engine, for the single pump for each set of four cylinders in the Selandia. We take it, though not based upon information from the owners, that the increase in the size of the engine has justified the pump per cylinder, as the fuel delivery from each pump has become somewhat more tangible. At the same time the liability to breakdown is correspondingly reduced.

The third alteration is probably rather a personal matter than one of necessity. In the "Selandia" the air compressor of the main engine had only a single-stage compressor which compressed air, delivered to it at 300 lb. per square inch from an auxiliary two stage compressor which was continually running, up to 900 lb. for blast air injection. There are certainly arguments in favor of that course, but in the "Glenapp" there are two three-stage compressors on the forward end of the crankshaft of each main engine, though there is still an auxiliary compressor which is always kept running when the ship is in crowded waters or when there is any chance of having to manoeuvre the engines. This compressor supplies air for manoeuvring purposes alone. We are not prepared to argue the pros and cons of the two arrangements, but we simply record the alterations.

Among minor points may be mentioned a neat method of indicating the direction in which the engines are running. It consists of no more than a little screw thread cut on the fuel pump shaft and covered by a brass plate with a glass opening. On the plate are two arrows pointing in opposite directions, one marked "ahead" and the other "astern." It is remarkable how clearly movements in either direction is conveyed to the mind by this simple expedient. Then, too, alterations, whether we should call them improvements or not we cannot say, have been made on the starting air admission valve arrangements. The main air admission valve of the system is opened and seated by compressed air, so that only a small by-pass valve has to be raised by the reversing lever to allow the comparatively large air admission valve to be opened instead of having to lift the valve direct by the reversing lever. When this valve is returned to its seat, so as to shut off the air, it is jammed home by a hand wheel, though the hand wheel cannot raise it off its seat owing to the length of travel and the position of the collar on the rod which holds the valve down.

We may note also that, whilst in the "Selandia" the fuel valve and the inlet and exhaust valves were in the same line—the former being in the centre of the cylinders—in the "Glenapp" the fuel valve is moved appreciably to one side, the inlet and exhaust valves being moved a corresponding amount to the opposite side. This modification has the effect of largely increasing the space between the valve pockets so that each can be completely water-jacketed, and the alteration is no doubt of considerable advantage. We were rather surprised to hear that the removel of the fuel nozzle from the centre of the dished piston has no appreciable effect on the fuel combustion. Finally, we may note that the lubricating pipes to the cylinders have been reduced to two per cylinder, one on each "thrust" side.

In the "Selandia" articles we raised doubts as to whether experience would show that the continued use of salt water for cylinder and cover cooling purposes would prove altogether satisfactory, but no need has apparently yet been found for fresh water, and the only results of using salt water seem to be that a certain amount of quite soft and fine scale is thrown down to the bottom of the passages, etc. This sludge can be very easily washed out, and no chipping or even brushing is required. This must indeed be a great relief, as the provision of evaporators, etc., could not be contemplated with complete equanimity.

We may recall that the "Selandia" had two sets of eight-cylinder single-acting four-cycle engines with cylinders 520 mm. diameter by 730 mm. stroke, giving 1,250 brake horse-power per set at 125 revolutions per minute. The "Glenapp" has also two sets of eight-cylinder four-cycle engines, but with cylinders 750 mm. diameter by 1,100 mm. stroke, giving 3,200 indicated horse-power per set at 120 revolutions per minute, and running down to about 42 revolutions per minute for dead slow. With propellers of 14 ft. 6 in. diameter by 12 ft. 6 in. pitch she has made a speed of over 14 knots. The crankshaft is 18¼ in. in diameter. The auxiliaries are all electrically driven. There are three sets of four-cylinder 320 brake horse-power Diesel engines driving 150-kilowatt dynamos for supplying current for lighting, heating, etc., and for the Hele-Shaw-Martinean steering gear which is fitted, and which is apparently giving as great satisfaction as ever. Then there are electrically driven centrifugal pumps for the circulation of lubricating oil, those for the salt water for cooling the jacket and cover, those for the fresh water for the piston, and for the fuel oil, all in duplicate. The fuel oil pumps are fitted with duplicate filters, so that one may be cleaned without stopping the engine. It is interesting to learn that the oil in the lubricating system is never completely renewed, but only added to from time to time, a course which is only rendered possible by the complete separation of the cylinders from the main lubricating system. The fuel used is at present Texas oil of .890 specific gravity, 185 degrees flash-point, and the consumption appears to be about 0.306 lb. per indicated horse-power per hour. There is about 2 per cent of sulphur in the oil, but it has not been found deleterious, as copper is carefully avoided in the fuel pipes.

The exhaust system is the same as on the "Selandia," except that escape into the atmosphere is made through two pipes bent slightly aft. We are glad to see that the use of the mizzen mast as a funnel has not been perpetuated.

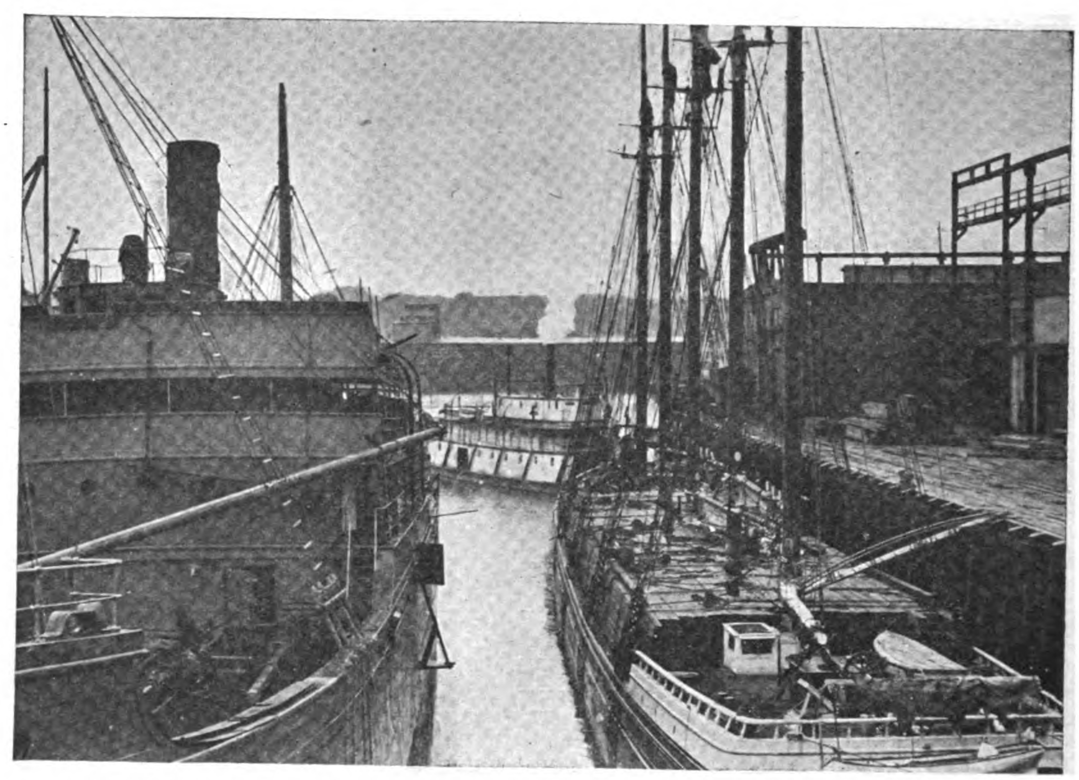
Before leaving this interesting ship we must mention a point which we could not help noticing, and that is the superior class of men that are being drawn into the marine engineering service afloat, at all events in motorships. There is no doubt, for one thing, that the conditions on a motorship as compared with a steamship are pleasanter, the heat is less, the fireman troubles do not exist, and higher wages can be afforded owing to reduced staff.

ERRATA.

On page 37 in the July issue we confess to have misled our readers in discussing the fuel costs etc., of the M. S. "Edith Nute." The error may be explained as follows. The cost of fuel consumed on the total voyage was $1,700 for 26,140 gals. The amount originally put in the tanks, 40,000 gallons must have cost at that rate $2,600. This, then, is the sum which could have been diminished by the sale of oil in Lisbon at $50 a ton. The selling price would have been $1,785, giving a profit of $885 on the oil sold and the net cost of the fuel bill would be $815. Quite a difference from the previous error of $85 net profit, but still resulting in remarkable economy in the fuel bill for the total voyage.

ELECTRICALLY OPERATED VALVES FOR INTERNAL-COMBUSTION ENGINES

In the weekly shipbuilding supplement of the "Journal of Commerce' just come to hand from London, we note a few remarks regarding the origin of the proposal to operate the valves of internal-combustion engines electrically. The correspondent refers to a paper read by him before a meeting of the Institution of Marine Engineers at the Naval and Engineering Exhibition on Sept. 17, 1910. Reference was made at that time to a large 4,000 h.p. gas engine then under design which embodied this feature. The paper as read was published in the Institution's journal for February, 1911.



An illustrated lecture! Forty vessels such as the one at the left are tied up in Portland, Ore. The auxiliary schooner at the right is ready to sail with nearly 1,000,000 feet of lumber. Capacity of steamer, about 1,250,000 feet. Operating costs—Steamship, $22,000.00 per month; motorship, only about $5,000.00!

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MOTORSHIPS BUILT ON THE PACIFIC COAST

There is no doubt in anybody's mind that the west coast shipyards produced a large share of the tonnage during the last three years built to provide the "bridge of ships" necessary for the winning of the war.

Many of the steel yards established enviable records in the hour of need. The wooden yards were excelled by none in the world for the number of boats launched and put into service. Incidentally, the prominence given to the motorship by these builders and owners places them in the foreground as pioneers in this country in the adoption of this inevitable type of cargo ship.

The wooden motorship has proven its reliability, and, while its seaworthiness is dependent upon decent care in its construction—which applies to the steamship as well,—its economy is superior to any similar ship with steam power. Following is a list of the wooden motorships built on the Pacific coast with such information concerning each as has been possible for us to obtain. It must be realized that additions are constantly being made, and "Motorship" will appreciate communications from builders and owners for further additions or corrections thereto. Data of this nature is valuable to every owner, operator, builder, designer and engine manufacturer. Subsequently, similar information will be compiled regarding the activities of the Gulf coast yards, and also for those along the Atlantic coast and on the Great Lakes.

MOTORSHIP "MT. SHASTA" CHANGES NAME

The name of the Winton-engined motorship "Mt. Shasta," owned by Gaston, Williams and Wigmore of New York, N. Y., has been changed to "Mt. Baker," at the request of the U. S. Shipping Board, as the latter were also operating a vessel of the same name. The "Mt. Baker" is a sister ship to the "Mt. Hood," which has been described in a previous issue of "Motorship." These vessels were built by the Supple Ballin Shipbuilding Co. at Portland, Ore., and have a deadweight capacity of 4,800 tons and a cargo-carrying capacity of 4,200. The high ratio of cargo capacity to deadweight is due to the fact that only 600 tons are required for ship's stores, 2,500 gallons of lubricating oil, 25,000 gals. of fuel oil, fresh water, etc. The gross tonnage is 2,904 tons, and the net is 2,429 tons. They are manned by a crew of 27 men, while a steamship of the same cargo capacity would require 42 men.

As we go to press the "Mt. Baker" is en route from New York to Liverpool, England.

JAPANESE ADMIRALTY TO BUILD DIESEL ENGINES

The Japanese Government has taken out a license for the construction of Sulzer Diesel engines and will build them in Japan.

Messrs. Suzusi & Co., a Japanese firm of shipowners and shipbuilders, have also acquired a similar license.

DIESEL ENGINE EXPERT, wants position. Twelve years' experience with European Diesel-engine. Four years with Heavy Oil Engine. First class reference. Will show my knowledge in construction and erection. Age 35. Address care of Motorship, 71 Columbia Street, Seattle.

MOTORSHIPS BUILT ON THE PACIFIC COAST

Name	Tonnage Gross	D. W.	Where Built	Date	Dimensions L. O. A.	Breadth	Depth	Power	Operators or Owners
Admiral Sims Auxiliary	1612 (net)	3525	Puget Sound Bridge & Dredging Co. Seattle	May 1918	267'-0"	43'-4"	23'-0"	2 Skandia 770 H.P.	Pacific Steamship Co., Seattle, Wash.
Admiral Mayo Auxiliary	1608 (net)	3525	Puget Sound Bridge & Dredging Co. Seattle, Wash.	July 1918	267'-0"	43'-4"	23'-0"	2 Skandia 770 H.P.	Pacific Steamship Co., Seattle, Wash.
Adrien Badin	....	2100	Peninsula S. B. Co., Portland, Ore.	1917	255'-0"	43'-4"	21'-0"	2 Winton 300 H.P.	French Interests.
Arras, Aux.	....	2900	Puget S'd. B. & D. Co., Seattle	Mar. 1918	250'-0"	43'-4"	21'-0"	2 Skandia 500 H.P.	Republic of France.
Astoria Aux. 4 Masted	1,500,000 ft. lumber		Astoria, Ore.	1917	229'-5"	44'-0"	18'-10"	2-240 H.P. Skandia.	Viking Ship Co., Portland, Ore.
Balestrand Aux. 5 Masted	3800	....	Aberdeen, Wash.	1917	267'-8"	48'-1'	23'-9"	2-Sumner 700 H. P.	Balistand Navigation Co., Seattle. Wash.
Barleux Aux. 4 Masted	....	2900	Puget S'd. B. & D. Co., Seattle	Aug. 1917	250'-0"	43'-4"	21'-0"	2 Skandia 500 H.P.	Republic of France.
Cethana	....	3328	Sloan S. B. Corp.	1918	280'-0"	46'-0"	24'-0"	2 McIntosh & Seymour 500 H.P.	Australian Commonwealth.
Challamba	....	3328	Sloan S. B. Corp.	1918	280'-0"	46'-0"	24'-0"	2 McIntosh & Seymour 500 H.P.	Australian Commonwealth.
Coolcha	....	3328	Sloan S. B. Corp.	1918	280'-0"	46'-0"	24'-0"	2 McIntosh & Seymour 500 H.P.	Australian Commonwealth.
Culburra	....	3328	Sloan S. B. Corp.	1918	280'-0"	46'-0"	24'-0"	2 McIntosh & Seymour 500 H.P.	Australian Commonwealth.
Dixmude Aux. 4 Masted	....	2900	Puget S'd. B. & D. Co., Seattle	Dec. 1917	250'-0"	43'-4"	21'-0"	2 Mietz & Weiss 500 H.P.	Republic of France.
Douaumont Aux.	....	2900	Puget S'd. B. & D. Co., Seattle	Nov. 1917	250'-0"	43'-4"	21'-0"	2 Skandia 500 H.P.	Republic of France.
Erris Aux.	....	2100	Peninsula S. B. Co.	....	255'-0"	43'-4"	21'-6"	2 Winton 600 H.P.	Erris Motorship Co.
Esperanza Aux	1600	2300	Peninsula S. B. Co.	....	255'-0"	43'-4"	21'-6"	2 Winton 600 H.P.	Bowman Bros.
Grays Harbor Aux. 5 Masted	....	3250	Grays Harbor S. B. Co., Aberdeen Wisc.	1917	290'-0"	48'-0"	20'-9"	2 Sumner 700 H.P.	Gaston, Williams & Wigmore, N. Y. C.
Hjeltenaes, Aux.	2500	3250	Grays Harbor S. B. Co., Aberdeen Wisc.	1917	268'-0"	48'-0"	24'-0"	2 Sumner 700 H.P.	French Interests.
Kirktind	....	3350	Elliott Bay S. B. Co., Seattle, Wash	....	260'-0"	46'-0"	26'-0"	2-500 H.P. Winton	American Motorship Co.
Lassen	....	675,000 Bd. Ft.	Mathews S. B. Co., Hoquiam, Wash.	1917	180'-0"	40'-0"	16'-0"	2-240 H.P. Skandia	E. K. Wood Lumber Co., San Francisco.
May	1745	....	Astoria, Ore.	1917	245'-7"	44'-6"	19'-8"	2 Skandia 480 H.P.	Dollar S. S. Co., San Francisco, Cal.
Korsnaes	3800	....	Olympia, Wash.	1918	......	....	....	2 Sumner 700 H.P.	O. A. Anderson, Portland, Ore.
Marie DeRonde Aux.	2415	3250	Aberdeen, Wash.	1918	268'-0"	48'-0"	26'-9"	2 Sumner 700 H.P.	Donald S. S. Co.
Mount Hood Aux.	....	2400	Mathews S. B. Co.	1918	250'-0"	44'-0"	21'-0"	2-500 H.P. Winton	M. Issaken, Christiana, Norway.
Mount Rainier	2397	3250	Aberdeen, Wash.	1917	263'-8"	48'-0"	23'-8"	2 Sumner 700 H.P.	Gaston, Williams, & Wigmore.
Mount Shasta Aux.	....	2400	Mathews S. B. Co.	1918	250'-0"	44'-0"	21'-0"	2-500 H.P. Winton	....
No. 4	....	3350	Elliott Bay S. B. Co.	....	260'-0"	46'-0"	26'-0"	2-500 H.P. Winton	Amer. Motorship Co.
Pechiney	....	2100	Peninsula S. B. Co.	....	255'	43'-4"	21'-0"	2 Winton 600 H.P.	....
Peronne, Aux.	....	2900	Puget S'd. B. & D. Co.	Apr. 1918	250'-0"	43'-4"	21'-0"	2 Skandia 500 H.P.	Republic of France.
Portland, Aux.	....	2900	Puget S'd. B. & D. Co.	Mar. 1917	250'-0"	43'-4"	21'-0"	2 Mietz & Weiss 500 H.P.	Pacific Motorship Co.
Remittent Aux.	....	2900	Puget S'd. B. & D. Co.	May 1917	250'-0"	43'-4"	21'-0"	2 Mietz & Weiss 500 H.P.	Alex. Prebensen.
Risor, Aux.	....	2900	Puget S'd. B. & D. Co.	July 1917	250'-0"	43'-4"	21'-0"	2 Mietz & Weiss 500 H.P.	Alex. Prebensen.
Santa Christina	2159	....	Aberdeen, Wash.	1917	224'-6"	42'-7"	25'-11"	2-320 H.P. Bolinder	W. R. Grace & Co.
Santa Elena	1983	2200	Hoquiam, Wash.	1917	225'-0"	42'-6"	24'-11"	2-320 H.P. Bolinder	W. R. Grace & Co.
Santa Isabel	1919	....	Hoquiam, Wash.	1917	216'-6"	42'-7"	25'-3"	2-320 H.P. Bolinder	W. R. Grace & Co.
Santino	2491	3250	Aberdeen, Wash.	1917	290'-0"	48'-0"	20'-9"	2-350 H.P. Sumner	Grays Harbor S. B. Co.
Semmeltind	....	3350	Elliott Bay S. B. Co.	....	260'-0"	46'-0"	26'-0"	2-500 H.P. Winton	Amer. Motorship Co.
Sierra	1034	1500	Mathews S. B. Co.	1916	220'-0"	42'-6"	19'-0"	2-320 H. P. Bolinder	E. K. Wood Lumber Co., San Francisco, Cal.
Tacoma	....	2900	Puget S'd. B. & D. Co.	Jan. 1917	220'-0"	43'-4"	21'-0"	2-240 H.P. Mietz & Weiss	Pacific M. S. Co., Christiania, Norway.
Trolltind	....	3350	Elliott Bay S. B. Co.	....	260'-0"	46'-0"	26'-0"	2-500 H.P. Winton	Amer. Motorship Co.
Ypres Aux. 4 Masted Schooner	....	2900	Puget S'd. B. & D. Co.	Jan. 1918	230'-4"	44'-4"	18'-9"	2 Mietz & Weiss 500 H.P.	Republic of France.
H. C. Hansen Aux. 5 Masted.	1660	....	Seaborn S. B. Co., Tacoma, Wash.	....	240'-9"	45'-0"	19'-4"	2-240 H.P. Skandia	H. C. Hansen, Porsgrund.
S. I. Allard	....	3500	St. Helens S. B. Co., St. Helens, Ore.	....	278'-0"	48'-2"	21'-9"	2-320 H.P. Bolinder	Chas. R. McCormick Co., San Francisco. Cal.
Oronite	....	....		....	......	....	....		
W. T. Burrows, Aux.	....	....	Sloan S. B. Corp., Olympia, Wash.	....	235'-0"	40'-0"	20'-0"	2-240 B.H.P. Skandia	Libby, McNeil & Libby.
Wergeland Aux. 5 Masted.	3800	....	Olympia S. B. Co., Olympia, Wash.	1917	268'-0"	48'-0"	24'-1"	2-350 B.H.P. Sumner	Wergeland Motorship Co., Portland, Ore.
Ethel Aux.	700	....	Col. Engg. Co., Portland, Ore.	....	172'-0"	36'-0"	16'-8"	....	M. T. Snyder, New Orleans, La.
June Aux. 3 Masted	....	....	St. Helens S. B. Co., St. Helens, Ore.	1916	159'-0"	35'-3"	13'-7"	2-150 H.P. Fairbanks-Morse	M. T. Snyder, New Orleans, La.
Template, Aux.	700	....	Col. Engg. Co., Portland, Ore.	....	172'-0"	36'-0"	16'-8"	....	M. T. Snyder, New Orleans, La.
Guanacosta, Aux. 4 Masted	....	....	....	....	......	.....	.....	400 H.P. Craig	....
Astri, Aux.	1780	2600	Portland, Ore.	....	246'-0"	44'-0"	22'-0"	2-320 B.H.P. Bolinder	A. O. Anderson & Co.
Apex, Aux.	622 (net)	....	....	....	155'-0"	36'-0"	19'-0"	350 H.P. Atlas	....
City of Portland	....	3500	....	....	275'-0"	48'-2"	21'-1"	2-320 H.P. Bolinder	Chas. R. McCormick Co., San Francisco, Cal.
City of St. Helens Aux. 5 Masked.	....	3300	....	....	285'-0"	48'-2"	24'-6"	2-320 H. P. Bolinder	Chas. R. McCormick Co., San Francisco Cal.
Alabama	....	....	Seattle, Wash.	....	270'-0"	46'-0"	26'-0"	2-500 McIntosh & Seymour	French Interests.
Libby Maine	....	2000	Standifer Const. Co., Portland, Ore.	....	240'-0"	43'-0"	24'-0"	2-320 H.P. Dow-Wms.	Libby, McNeil & Libby.
Oregon	1630	3200	Alaska Pac. Co., Seattle	1917	234'-0"	42'-0"	23'-0"	2-400 I.H.P. Southwark Harris	Alaska Paci. Nav. Co. Seattle, Wash.
General Pershing, Aux. 5 Masted.	3800	....	....	....	268'-0"	48'-0"	23'-10"	2-350 S.H.P. Sumner	....
Pisaqua	4500	....	....	....	....	...	....	2-600 S.H.P. Sumner	....
Chilean Naval Training Ship	4500	....	....	....	....	...	....	2-600 S.H.P. Sumner	....
Marie Barnard	1476	2250	Wallace Shipyard, Vancouver, B. C.	....	240'-0"	44'-0"	19'-4"	2-160 H. P. Bolinder	Canada West Coast Nav. Co., Vancouver, B. C.
L'Aiglon	....	2600	Peninsula S. B. Co., Portland, Ore.	....	225'-0"	....	....	2-300 H.P. Winton	....
Margaret, Aux.	1613	2200	McEachern S. B. Co.	....	230'-0"	44'-0"	18'-9"	2-240 H.P. Skandia	A. O. Anderson & Co., Portland, Ore.
Margaret Haney, Aux.	1372	2250	Victoria, B. C.	1917	240'-0"	43'-4"	19'-3"	2-160 H.P. Bolinder	Canada West Coast Nav. Co., Vancouver, B. C.
Mabel Brown, Aux.	....	2250	Wallace Shipyard, Vancouver, B. C.	1917	225'-0"	44'-0"	23'-0"	2-160 H. P. Bolinder	Canada West Coast Nav. Co., Vancouver, B. C.
Mugrudada, Aux.	....	2600	McEachern S. B. Co.	....	250'-0"	....	....	2-240 H. P. Skandia	Brazilian Interests.
Jean Steedman, Aux.	....	2250	Victoria, B. C.	....	225'-0"	44'-0"	23'-0"	2-160 H.P. Bolinder	Canada West Coast Nav. Co.
Pauline, Aux.	....	2200	McEachern S. B. Co.,	....	248'-0"	....	....	2-240 H.P. Skandia	Auditor S. S. Co.
Suzanne, Aux.	....	2500	Aberdeen S. B. Co.	1917	233'-0"	43'-0"	18'-6"	2-240 H.P. Skandia	French Government.
Diria, Aux.	....	2000	Columbia Enging Wks., Portland	....	230'-0"	....	....	2-200 Craig	Manganese Mining Co., N. Y. C.
Santa Flavi, Aux.	....	2200	Aberdeen S. B. Co.	1917	235'-0"	43'-0"	19'-5"	2-160 H.P. Bolinder	W. R. Grace, San Francisco, Cal.
James Timpson	....	1700	Standifer Const. Co.	....	200'-0"	....	....	2-500 Winton	Libby, McNeil & Libby.
Lasser, Aux.	....	2500	Mathews S. B. Co.	....	240'-0"	....	....	2-350 Skandia	General Fireproofing Co. New York, N. Y.
Jessie Norcross Aux.	1481	2500	Vancouver, B. C.	1917	240'-6"	43'-7"	19'-4"	2-160 H.P. Bolinder	Canada West Coast Nav. Co.
Mabel Stewart, Aux.	....	2500	Vancouver, B. C.	1917	243'-3"	44'-0"	19'-3"	2-160 H. P. Bolinder	Canada West Coast Nav. Co.
Laurel Whalen	....	2500	Victoria, B. C.	1917	240'-3"	43'-10"	19'-0"	2-160 H.P. Bolinder	Canada West Coast Nav. Co.
Janet Carruthers	1466	2500	Vancouver, B. C.	1917	240'-3"	44'-0"	19'-4"	2-160 H.P. Bolinder	Canada West Coast Nav. Co.
Esquimalt	1373	2500	....	....	240'-9"	44'-3"	19'-5"	2-160 H.P. Bolinder	....
Geraldine Wolvine Aux. 5 Masted	1472	2500	Vancouver, B. C.	1917	240'-0"	43'-9"	19'-0"	2-160 H.P. Bolinder	Canada West Coast Nav. Co.
Malahat	....	2500	....	1917	240'-0"	....	....	....	....
Beatrice Castle	....	2500	....	1917	240'-0"	....	....	....	....
Mount Baker Formerly Mt. Shasta	2904	4800	Supple & Ballin, Portland, Ore.	1918	308'	44'-6"	26'-0"	2-500 H.P. Winton	Gaston, Williams & Wigmore
Mount Hood	2904	4800	Supple & Ballin, Portland, Ore.	1918	308'	44'-6"	26'-0"	2-500 H.P. Winton	Gaston, Williams & Wigmore
Fanestrand, Aux. 5 Masted	2350	....	Aberdeen, Wash.	1917	261'-6"	48'-3"	23'-9"	2-250 Skandia	H. Saith
La Merced	1696	....	Benicia, Cal.	1917	232'-0"	43'-7"	26'-7"	Twin Screw	Standard Oil Co., Frisco, Cal.
Pauline, Aux. 4 Masted Schr.	1750	....	McEachern Ship Co., Astoria, Ore.	1918	248'-3"	44'-6"	19'-8"	2-250 H.P. Skandia	Stay and Co.

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THE PATTERSON-MACDONALD SHIPBUILDING COMPANY

The recent satisfactory showing made by the motorship "Benowa," built at the yards of the Patterson-MacDonald Shipbuilding Company of Seattle, calls attention to the rapid development of this comparatively young organization. Founded in June, 1917, by A. MacDonald, it launched its first ship in August of the following year. Great handicaps had to be overcome this first year, as the company was not working on Government contracts, and for this reason could not secure deliveries of material. Success in surmounting the resulting difficulties is due largely to the resourcefulness of Mr. MacDonald, whose lifelong experience with the shipbuilding business enabled him to overcome difficulties which would have overwhelmed an executive less versatile.

As a boy of nine, young MacDonald was employed in the world-famous yards on the Clyde. Later he was associated with the Fairfield Shipbuilding Company, and still later engaged in the contracting end of the shipbuilding business. He has worked at practically all the trades which enter into the building of a ship, and for this reason has an intimate knowledge of details and of the relations between the various parts of modern ships of all types.

The four shipways and other equipment of the Patterson-MacDonald yards were originally designed for the construction of wooden vessels, but within the next two months the plant will be adapted to the building of steel ships. The conversion will cost approximately $250,000, but when it is completed the company will be in possession of every facility for building the 8,000-ton steel vessels to which it will devote most of its attention. Wooden shipbuilding will no longer be handled.

Several additions have recently been made to the company's board, which now consists of James Black, president; Alexander MacDonald, vice-president and general manager; F. L. Pritchard, second vice-president; J. L. McLean, secretary-treasurer; Adam Patterson, Jr.; and W. J. Thomas. A. F. Marshal is general superintendent of the yards.

Mano Zan, Vice Pres. Gulowsen Sales Corpn.

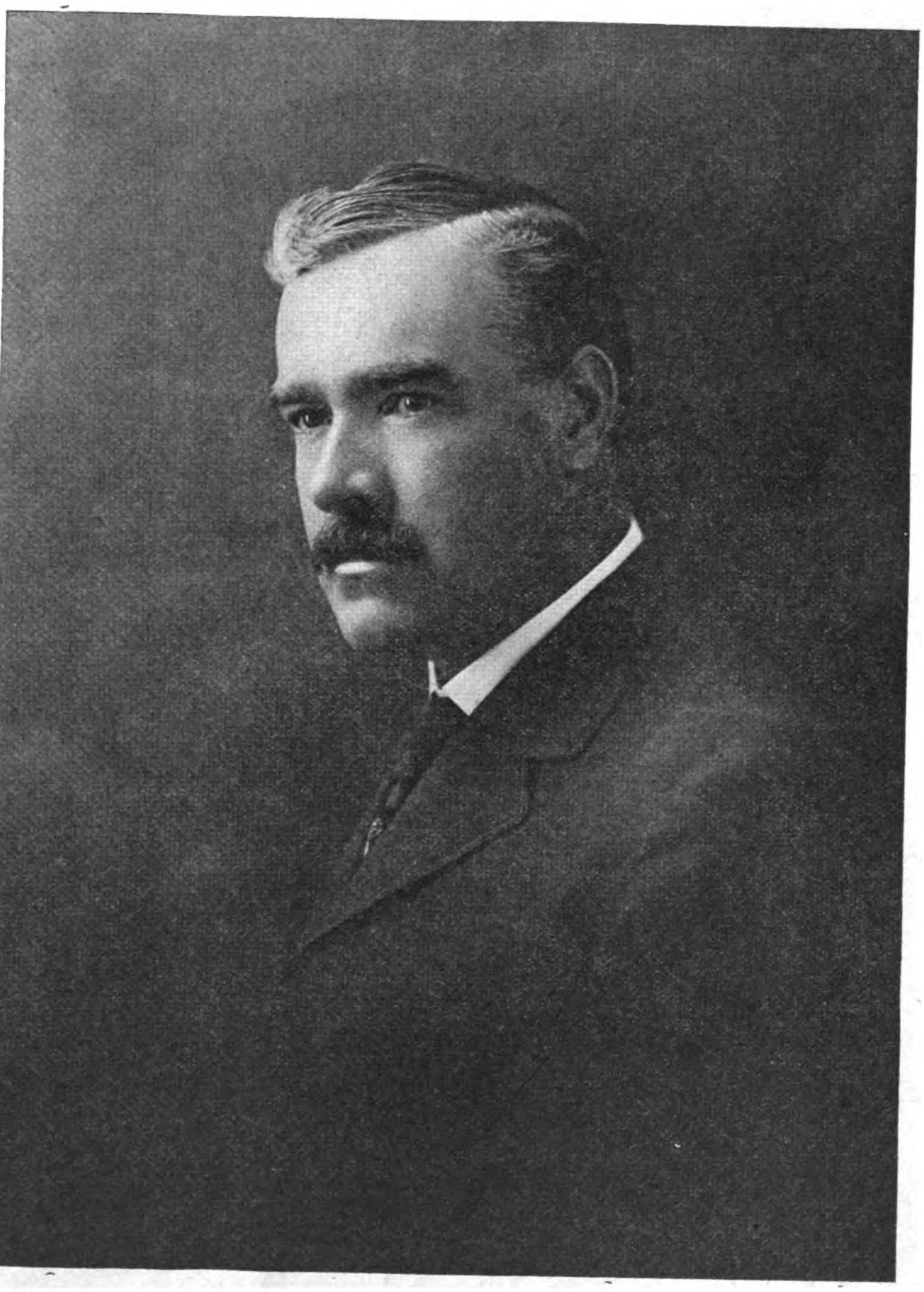
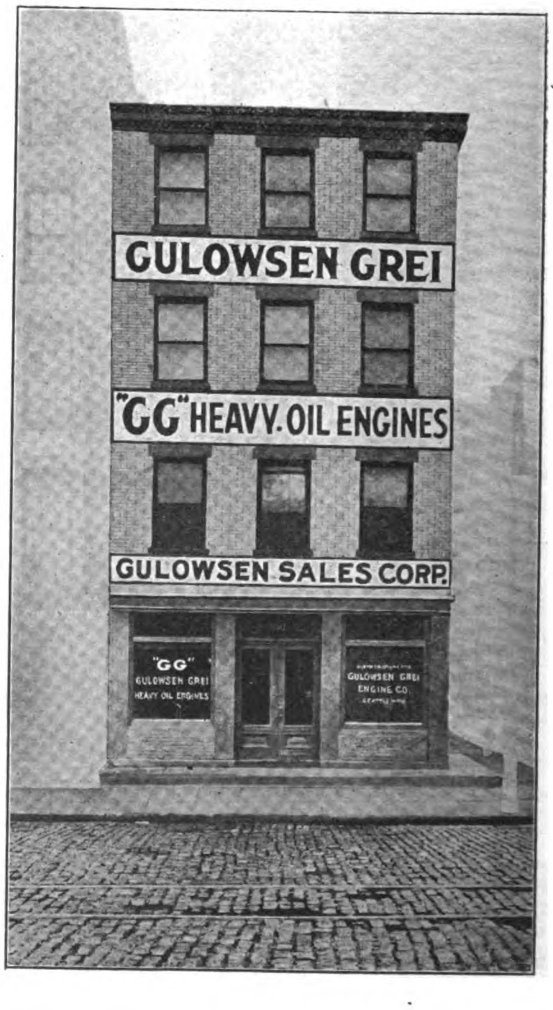


Photo by La Pine Studio, Seattle, Wash.

A. MAC DONALD
V. P. & G. M., Patterson-MacDonald Shipbuilding Co., Seattle, Wash.

In keeping with the policy established for their American business, the Gulowsen interests have announced the formation of the Gulowsen Sales Corporation. This new company will have entire charge of the distribution of "GG" Heavy Oil Engines, manufactured by the Gulowsen Grei Engine Company of Seattle, Washington and A. Gulowsen A/S at Christiania, Norway for the United States, its territories and such foreign markets as may be best served from the American factory.

Mr. A. Gulowsen is president, and Mr. Mano Zan until lately general sales manager of the Gerrard Wire Tying Machines Company, has been elected vice-president, and will direct the policies of the new sales organization. The Eastern Division has its headquarters at No. 160 South St., New York City. Offices and display rooms have been established. From this point the Eastern Coast will be under the supervision of Mr. R. A. Rossoe, who has been appointed manager Eastern Division Sales. This gentleman is an engineer of large experience in heavy oil engine design and construction. Resident sales engineers at Boston, New York and New Orleans, will serve these territories with technical assistance.



350-TON MOTOR VESSEL

The "Admiral Vernon" was launched at Chester from the yard of Messrs. Isaac J. Abdela and Mitchell, Queen's Ferry, on May 31st. She is 133 ft. 6 in. in length, with a beam of 23 ft. 6 in., and a depth of 11 ft. 6 in., the carrying capacity being 350 tons deadweight.

She is fitted with a four-cylinder Bolinder engine developing 320 b.h.p.

THE MOTORSHIP "SABARA"

The motorship "Sabara" (ex-"Monte Penedo"), which was formerly owned by the German South American Line and was acquired by the Brazilian Government (having been interned at a Brazilian port), is now being operated by the French Government and is running between America and France.

"Motorship" Illustrated Patent Record*

Selected Abstracts of Recent Published Patents of Internal Combustion Engines

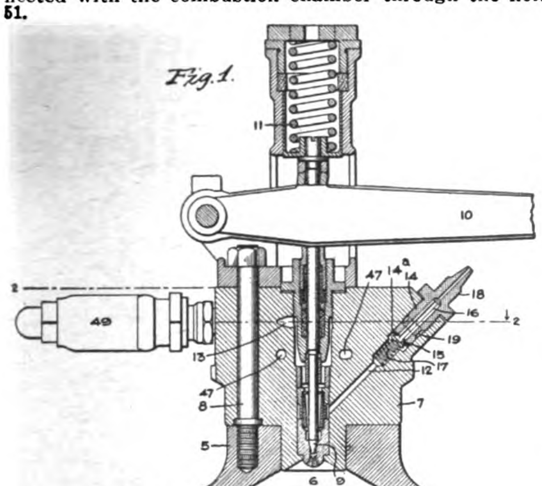
Copies of original specifications may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

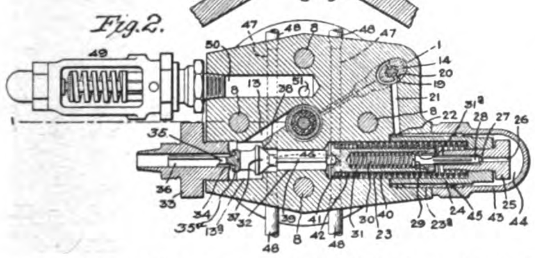
***Compiled and described by H. Schreck, Memb. Amer. Soc. Mech. Eng'rs**

1,298,605. Mar. 25, 1919. Fuel Injection Valve. W. E. Ver Planck & H. W. Stock, of Erie, Pa. Assignors to the General Electric Co.

This invention refers to a fuel valve of a Diesel engine on which the fuel is supplied by a suitable pump and is injected into the cylinder by means of compressed air. The object of this invention is to provide means to by-pass the fuel during the starting period, to close off the injection air during this period, and to cooperate the control of the injection air and of the fuel with each other, that is; when the injection valve opens the fuel by-pass valve to close.

In the illustration represents 5 the cylinder head, 18 the fuel oil supply connection, 33 the injection air connection, 9 the injection valve operated by rocker arm 10, and 49 is a safety valve for the cylinder connected with the combustion chamber through the hole 51.



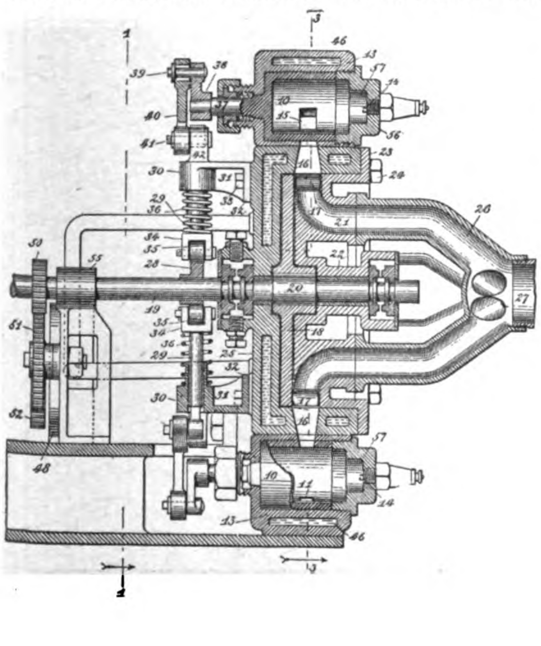


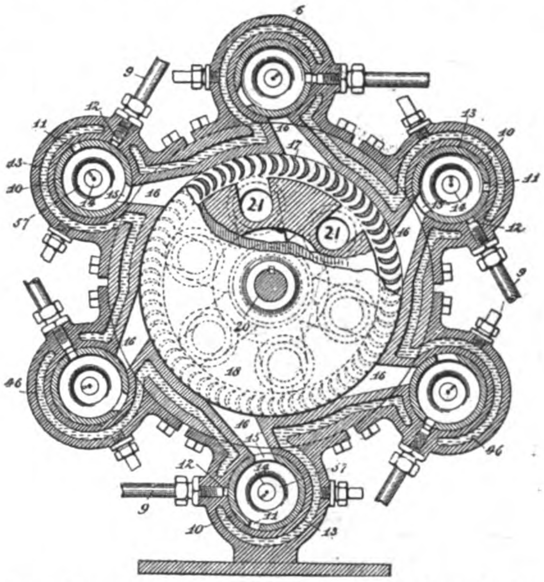
When the engine is at rest the injection air valve 35 is held on its seat 34 by the spring 40 which also holds the valve 37 open. The movement of spring holder 31 in turn opens the fuel by-pass valve 28 by pushing against its head 29. Then all fuel being delivered at 18 will pass through 16, 15, 20, 19, 21, grooves 45, 26, 27, 28, 23, into the passage 32, from which it will be drained away through the drain holes 46 into the overflow 47 and 48.

During this period or period of starting no injection air will be lost since valve 35 is held closed. The spring 40 is set in such a way that the injection air will open the valve as soon as it reaches a certain predetermined pressure. In this moment the valve 35 will open, valve 37 will close and the fuel by-pass valve 27 can move back and is forced on its seat 27 by spring 30. The fuel and air are then delivered to the fuel injection valve as on every ordinary Diesel engine.

1,296,980. Mar. 11, 1919. Internal Combustion Turbine. F. Lobo. of Brooklyn, N. Y.

This invention relates to a turbine the rotation of which is performed by the expanding action of products of combustion of an explosive fuel. A hydrocarbon gas mixed with the necessary atmospheric air is compressed by some outside means before being supplied to the engine at the feed pipes 9. Rotary sleeve valves 10 are rocked into such a position as to admit said compressed mixture. This inlet port being

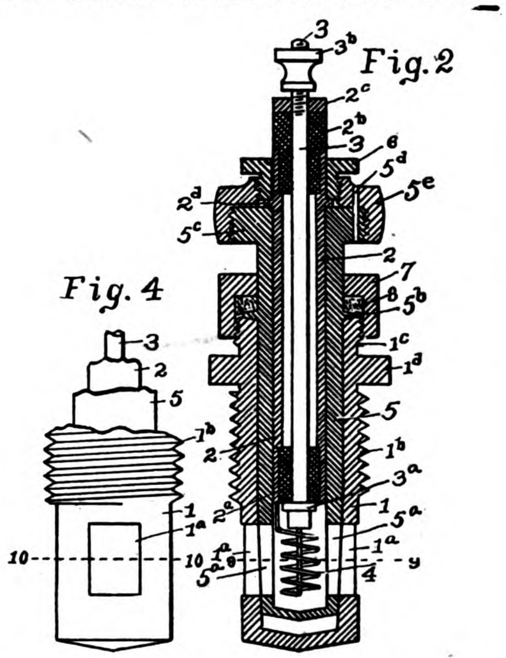




shut off a properly timed electric spark plug 14 will ignite said mixture and at the moment at which the exhaust port 15 of one of shown six sleeve valves will register with port 16, the gases will expand, flow through these passages and exert its power upon the buckets 17 of the rotor 18 and finally escape into the atmosphere through the exhaust ports 21.

1,293,520. Febr. 4, 1919. Ignition Plug. G. V. Nolte, of Bellingham, and J. E. Smith, of Beach, Wash.

This invention refers to an improvement of ignition plugs for internal combustion engines of the low pressure type. The service of this plug is intended only for the starting of the engine. In a small cage an electrically heated wire is arranged which will ignite the fuel. This wire can be shielded during the oper-

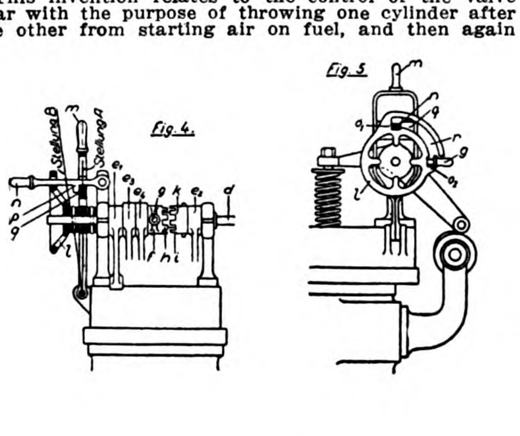


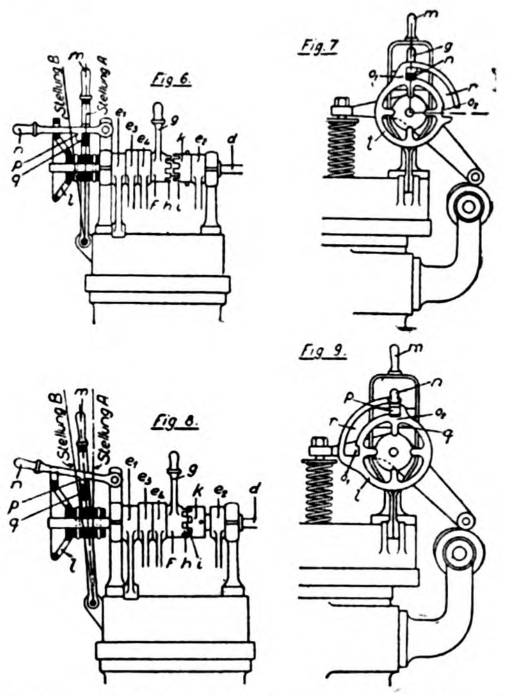
ation of the engine from the exposure to the hot gases by a turn of 90 degrees of the cage, or it even can be removed and replaced while the engine is running.

The same inventors have been granted patent No. 1,249,465 on Dec. 11, 1917 for the same object, but especially adapted to large engines.

307,881. Special Design of Gear Control. Stefan Loeffler, of Charlottenburg, Germany (German Patent).

This invention relates to the control of the valve gear with the purpose of throwing one cylinder after the other from starting air on fuel, and then again





controlling all injection valves together after the engine is in operation.

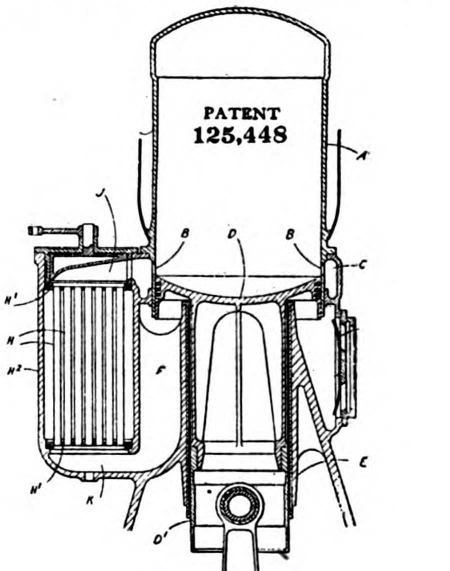
The lever (e_3) operates the starting valve, and (e_4) the injection valve. Both of these levers are supported on a common eccentric bushing, whose projecting end is indicated by (f) and its handle (g). Figs. 4 and 5 represent the engine in the starting position, that is, the levers (g) of every cylinder are placed in a horizontal position which lifts the injection valve lever off the can and brings the starting valve lever in contact with its cam. After the engine is started up, the eccentric bushing is turned by 90° by bringing the handles (g) into the vertical position (Figs. 6 and 7) on one cylinder after the other, thus bringing the fuel valve levers in operation and disengaging the starting valves.

As soon as the engine is working properly the handwheel (l) is turned over 90° (Figs. 8 and 9), then a slot on its periphery is given free, which allows to raise the lever (n) and to pull by means of lever (m) the shaft (d) to the left. This shaft, which runs over all of the cylinder, carries fixed to it the collars (k), which will then engage the claws at the end of the eccentric bushings, and then, if desired, all injection valve levers can be controlled simultaneously by the turning of this handwheel (l). It will be noticed that the various hand operations are interlocked against one another.

125,448. Supercharging of Cylinders. H. R. Ricardo, of London, S. W., England (British Patent).

This invention relates to a cooling arrangement of the intake air for the purpose of supercharging the cylinder of a four-cycle engine.

On the proposed engine the exhaust valves are in the cylinder head (not shown in the drawing), and the air intake is through the valves (G). Towards the end of each working stroke when the ports (B) will be uncov-



ered by the piston, a part of the products of combustion will enter the cooling tubes (H), and partly mix with the fresh air in pump chamber (F). After the piston (D) has reached the end of the stroke, the exhaust valves in the head will be opened, with the result that the cooled gases can escape, cooling at the same time piston and exhaust valve. Towards the end of each suction stroke a charge of air which has been compressed in the pump chamber (F) passes into the cylinder as a supercharge.

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